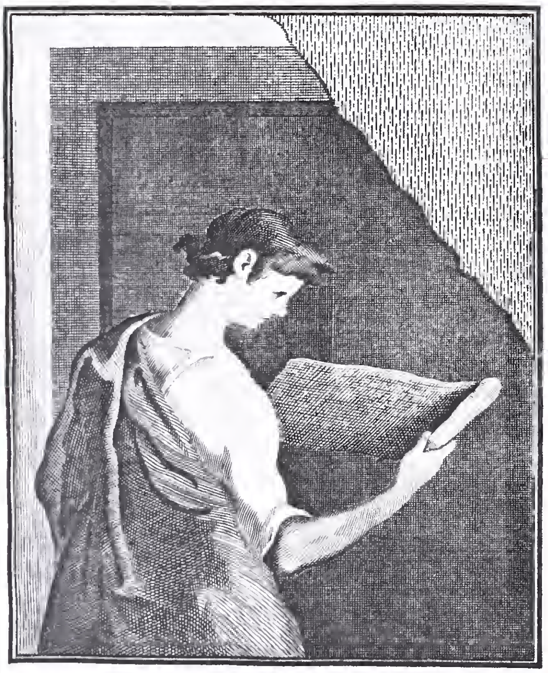

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PAPERS

READ AT

The Royal Institute of British Architects,

SESSION 1854—55.

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EXTRACTS FROM A PAPER ON THE APPLICATION OF THE HARMONIC LAW OF NATURE IN THE ORTHOGRAPHY OF ARCHITECTURAL DESIGN;—ILLUSTRATED BY A GOTHIC ELEVATION, SIMILAR TO THAT OF THE EAST END OF LINCOLN CATHEDRAL.

By D. R. Hay, Esq., F.R.S.E.

Read at the Ordinary General Meeting of the Royal Institute of British Architects,
November 13th, 1854.

In this communication Mr. Hay showed how the harmonic law, described and applied to the front elevation of the Parthenon at Athens, in his former Paper,* might be similarly applied and made to operate in the construction of a Gothic elevation; his object being a further attempt to prove that there really does exist a mathematical law coinciding with the harmony always found in nature, and that this law can be applied to impart orthographic beauty to architectural structures of any order or style.

He explained numerically the simple nature of the law of harmonic ratio—a law which is found operating in the force of gravity; in the planetary movements; in heat, light, electricity, and chemical affinity; in the forms of animals and plants; and in the perceptions of the human mind.

The first numerical rule is, that any number, to be harmonic, must either be one of the four first multiples of 1—viz., 2, 3, 5, and 7—or a multiple of one of these simple numbers. This rule is based upon the simple fact, that the three first numerals, 1, 2, 3, embody all the principles of harmony, and it is by their simplest modes of union that the above four governing elements are produced.

The second rule is, that, for the practical application of these harmonic numbers, they must be formed into a series of scales, arranged in such a manner that the most simple be made to form the primary or governing elements.

The third rule is, that, in employing these numbers as divisors, the parts of whatever is divided must be integral parts.

The simple elementary figures which may be combined in an architectural design are—

The square, and its curvilinear figure, the circle.
The oblong rectangle, and its curvilinear figure, the ellipse.
The isosceles triangle, and its curvilinear figure, the composite ellipse.

The basis of his theory being that the eye estimates proportion not by distance, but by angular direction, it follows that each of these figures is governed in its individual proportions by a particular angle, and that their harmonic combination in architecture is likewise governed by angles. This being the case, there must be a fundamental angle, to which all other angles so employed should harmonically relate as an integral part.

Now, as the employment of these figures in architectural composition demands that their axes, whether equal or unequal, should be in the horizontal and vertical lines, and as the meeting of these lines makes the right angle, that angle must, in this case, necessarily be taken as the fundamental angle.

---

* Read February 7, 1853; afterwards printed, and forwarded to the members of the Institute. It was subsequently published, with illustrations, by Mr. Hay.

The manner of applying the law of numerical ratio, in the construction of these six elementary figures, having been fully explained in his former communication, as well as in several of his published works, he confined his illustrations to a few simple examples of its effect in harmoniously arranging groups of rectangles.

Four scales of harmonic parts of the right angle being obtained by dividing the quadrant of a circle by elementary harmonic numbers, some of these are employed to form diagonals to a series of rectangles. It is the nature of harmonic ratio, as applied to form, to require that, when any two geometric figures are placed in juxta-position, in order that a proper contrast be produced, their respective proportions must bear a distinct and definite ratio to each other. (This was illustrated by eight groups of rectangles, selected from the foregoing series.)

The east end of Lincoln Cathedral is, in the general arrangement of its parts, decidedly a vertical composition, while that of the Parthenon is decidedly a horizontal one. The first is composed of seven vertical parts, divided horizontally into bases, windows, and tracery, ending in a series of seven acute angles. The second is composed of three horizontal parts, vertically divided into columns, triglyphs, and metopes, and surmounted by one obtuse angle. Notwithstanding the difference of character thus existing between these examples, it is confirmatory of the truth of the system, and the great scope of its usefulness, to find that the proportions of the one style are as susceptible of the application of this harmonic law as those of the other.

The fundamental angles in the front of the Parthenon had been shown to be the following:—

$$\left.\begin{array}{cccccc} (1) & (\tfrac{1}{2}) & (\tfrac{1}{3}) & (\tfrac{1}{5}) & (\tfrac{1}{7}) & (\tfrac{1}{9}) \\ & (\tfrac{1}{4}) & (\tfrac{1}{6}) & (\tfrac{1}{10}) & & (\tfrac{1}{18}) \\ & (\tfrac{1}{8}) & & & & \\ & (\tfrac{1}{16}) & & & & \end{array}\right\} \begin{array}{l}\text{of the} \\ \text{Right Angle.}\end{array}$$

Those he had employed in the construction of the Gothic front are:—

$$\left.\begin{array}{cccccc} (1) & (\tfrac{1}{2}) & (\tfrac{1}{3}) & (\tfrac{1}{5}) & (\tfrac{1}{7}) & (\tfrac{1}{9}) \\ & (\tfrac{1}{4}) & (\tfrac{1}{6}) & (\tfrac{1}{10}) & & \\ & & (\tfrac{1}{12}) & & & \end{array}\right\} \begin{array}{l}\text{of the} \\ \text{Right Angle.}\end{array}$$

The Parthenon being, as already observed, a horizontal composition, the principal angles were made with the horizontal line. In the present case, the composition being vertical, the principal angles, nine in number, are made with the vertical line.

Having in recent works pointed out the operation of this law of nature, in the constitution of that beauty of form and proportion by which the human figure is distinguished above all other works of creation, as also the application of the same law by the ancient Greeks, in those inimitable sculptures by which they represented the figures and attributes of their various deities during the best period of art the world ever knew; having afterwards discovered that the same law, similarly applied by the same people during the same period, governed the general form and the relative proportions of all the parts, as well as all the curves, of the details of that unequalled monument of architectural chasteness and beauty, the Parthenon of Athens; and having on the present occasion shown that the same law, similarly systematised, is equally calculated to govern the form and proportions of Gothic architecture, it might be asked what further proof is required to establish the fact, that there really is a mathematical law coincident with the harmony of nature, and applicable to building?

In illustrating this latter proof of the existence of such a law, he adopted the design of one of the most beautiful and perfect remains of those interesting monuments of the piety of our ancestors which he could find; and although not enabled to ascertain with sufficient certainty that the law in question was really applied in the execution of this design, yet the approximation to a perfect development is so close as to suggest that it really was, although perhaps in a less perfect manner. From this latter fact the probability suggests itself, that a system of applying this law of nature in architectural construction was the only great practical secret of the Free-masons; all their other secrets being connected, not with their art, but with the social constitution of their society.

It can scarcely be doubted that there were some such practically useful secrets amongst the Free-masons, or early Gothic architects; for we find, in all the venerable remains of their art which exist in this country, symmetrical elegance of form pervading the general design—harmonious proportion amongst all the parts—beautiful geometrical arrangements throughout all the tracery—as well as in the elegantly symmetrised, foliated decorations, which belong to that style of architecture. But it is, at the same time, worthy of remark, that whenever they diverged from architecture to sculpture and painting, and attempted to represent the human figure, or even any of the lower animals, their productions are uniformly such as to convince us that in this country these arts were in a most degraded state of barbarism—the figures are grossly disproportioned, and often much distorted in their attitudes; the subjects they represent are paltry in composition, and puerile in conception; while their representations of animals and chimeras are whimsically absurd. It would therefore appear that architecture, as a fine art, must have been preserved by some peculiar influence from partaking of the barbarism so apparent in the sister arts of that period.

Pythagoras, who is said to have acquired his knowledge of the harmonic law of numbers from Egypt, formed, it would appear, a system much more perfect and comprehensive than that practised by the Free-masons in the middle ages of Christianity; for it was as applicable to sculpture, painting, and music as it was to architecture. This perfection in architecture is strikingly exemplified in the Parthenon, as compared with the Gothic structures of the middle ages; for it will be found that the whole six elementary figures already enumerated as belonging to architecture are required in completing the orthographic beauty of that noble structure,—and, amongst these, none conduce more to that beauty than the simple and composite ellipses. Now, in the architecture of the best periods of Gothic, or indeed in that of any after period (Roman architecture included), these beautiful curves seem to have been ignored, and that of the circle alone employed.

Be these matters as they may, the great law of numerical harmonic ratio remains unalterable; and a proper application of it in science and art will never fail to be as productive of effect as its operation in nature is universal, certain, and continual.

The Chairman, Mr. George Mair, Fellow, regretted the absence of Mr. Penrose, who was so well qualified to appreciate a question to which Mr. Hay had evidently given a degree of attention and research which entitled him to the thanks of the Meeting.

Mr. Papworth, Fellow, said, it appeared that the elevation exhibited was not *exactly* that of the east end of Lincoln Cathedral, but was only "similar" to it; a matter which he thought very fortunate The external structure of a large church evidently depended upon the internal pillars; and it could hardly be conceived that the end of a church was designed in the first place, and that the whole plan should then be made subservient to that one front. Why, in this case, should either front be chosen? Why not the long side of the building, which was a much more prominent feature? He thought the Institute had got into the difficulty, in such discussions as the present, of very nearly having their patience exhausted. He had been struck with a remark in Boisserée's Description of Cologne Cathedral, on the use of the central angles of polygons, which led to the inference, that the smaller the comparative size of the base of any portion of a Gothic structure, whether gable, tower buttress, or pinnacle, and the higher its actual position in the structure, so much the taller was its proportion, and so much smaller was the angle at the apex of its covering. He believed this was the only fact constant in the works published on this subject.

The Rev. Mr. Petit, Hon. Member, said he had not studied Mr. Hay's system, but he thought that any system must be very comprehensive indeed which could include all the beautiful and varied proportions of Gothic architecture. Lichfield Cathedral was a remarkable example of the number of different elements which might be taken as the basis of such a system; such as the length of the nave, its proportion to the choir; the width of the central tower, its height above the roof; the height of the building itself; the proportion of the west towers to the centre tower, &c. Such a mathematical system as Mr. Hay's might be made applicable to one particular front, but could hardly apply to all the various component parts of buildings of the Mediæval period.

The Chairman reminded the Meeting of the ceiling of the great room of the Society of Arts, which had been decorated by Mr. Hay, as an illustration of some of his theories.

Mr. C. H. Smith, Visitor, objected strongly to that part of Mr. Hay's paper which had spoken of Gothic sculpture in a depreciating manner. Flaxman had always expressed the highest admiration of those works, and the cathedrals of Salisbury, Worcester, and Lincoln, with Henry the Seventh's Chapel, furnished ample proof that Mr. Hay was either not a competent authority on this subject, or had not sufficiently studied it. These works, moreover, were chiefly by English artists. The monument in Westminster Abbey, to a youthful daughter of Edward the Third, was, it appeared, submitted to competition. The names of five competitors were mentioned in the chronicles, and one of them, who was evidently an Englishman, came up from Gloucester to explain his design, and was allowed a sum of money for his travelling expenses.

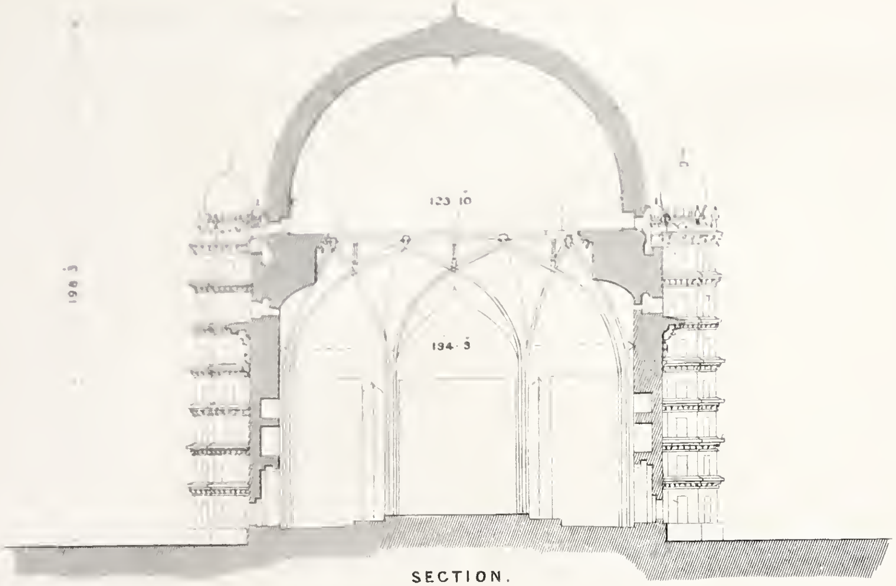
Mr. Beck, Associate, said, it appeared to him that the sense of harmony and proportion in a building was dependent on its harmonising or sympathising with our own system generally, and particularly with the organ by which it was viewed, namely the eye. Neither the eye, nor any other member of the body, could be moved otherwise than in easy flowing curves, and he would ask whether the beauty of such an edifice, as had been under consideration, was not mainly due to its presenting to the eye (which could not embrace the whole at once) such lines as could be easily traversed by the peculiar motion of that organ. At all events, he considered that the harmony which pervaded these structures was something more subtle than could be grasped by numbers.

Dr. R. Dickson, Visitor, strongly concurred with Mr. Smith in the excellence of Mediæval sculpture, and adverted to the opinions of Professor Kinkel, who, in his lectures at the London University, had enforced the same view of the question.

Mr. Nelson, Hon. Sec., spoke to the same effect. It had been objected that the statues in the west front of Wells Cathedral were unnaturally tall; but it had been proved that this was intentional, in order to give them a proper effect when viewed from below. He especially referred to the beauty of the sculptured foliage in the capitals and other parts of ancient Gothic churches.

Thanks were voted to Mr. Hay, and the Meeting adjourned.

THE GOL GOOMUZ
BEEJAPORE



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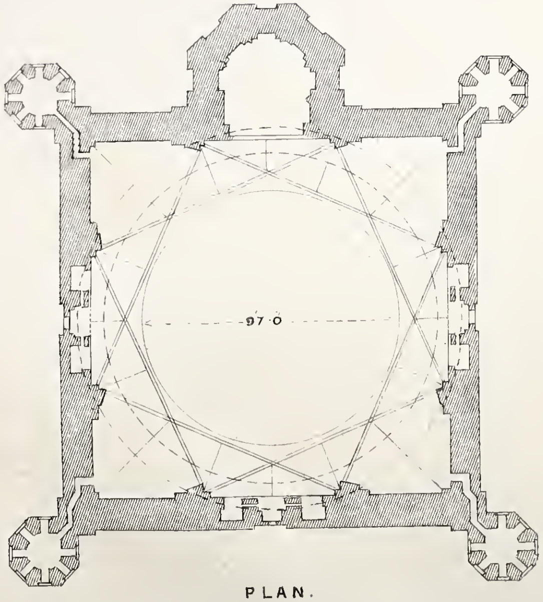

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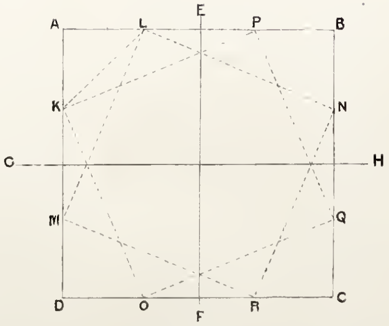
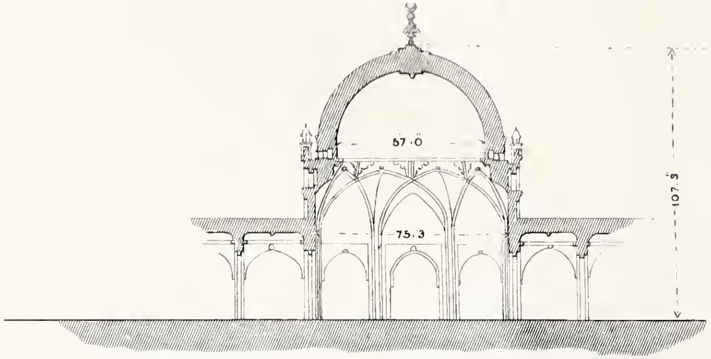


THE JUMMA MUSJEED.
BEEJAPORE.



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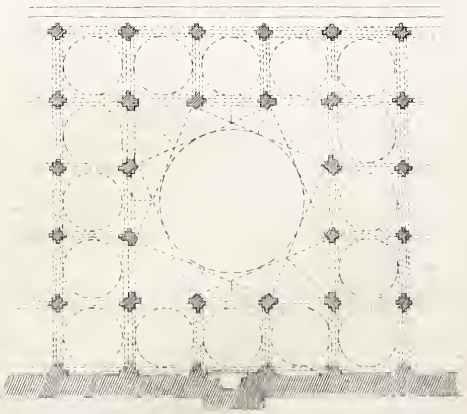

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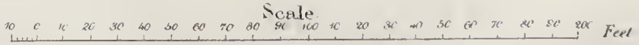

Vincent Brooks lith. King St Covent Gdn

ON THE ARCHITECTURAL SPLENDOUR OF THE CITY OF BEEJAPORE.

By James Fergusson, Associate, F.R.A.S.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, Nov. 27th, 1854.

It is, perhaps, unfortunate for me that the subjects on which I have on former occasions had the honor of addressing the Institute, have been either purely Oriental, or so connected with the far East, as to be beyond the usual range of an Architect's studies, and that consequently they could not be expected to excite the same interest as the more familiar styles of the West.

On the present occasion the same objection still applies. The subject is again Indian, but the style is the Saracenic, which is more familiar to us from the buildings at Granada and Cairo, now tolerably well known to Europeans; and one of the buildings I shall have this evening to describe, is so remarkable, both for artistic and constructive excellence, that it must in future take rank among the principal buildings of the world, and no one will venture hereafter to write a Treatise on Domes, without including the Tomb of Muhammed of Beejapore, as one of the most remarkable specimens of its class.

Before proceeding further, I may as well mention that I have never myself been able to visit that city; and that it is one of the very few capitals of the East which I have not personally examined. Till lately this was a subject of bitter regret to me; though I now rather congratulate myself on the accident, for it was this omission that led me to urge my friend Col. Sykes to try and procure such drawings as might at least make the dimensions and construction of its buildings intelligible. With that zeal for science for which he is so well known, and that energy which characterises all he does, Col. Sykes has far exceeded my requisition, and has procured from India by far the finest set of drawings that have ever come from that country, and which, as far as they go, leave nothing to be desired.

These drawings, some of which are now suspended on the walls, were made under the superintendence of Capt. Hart, of the Company's Engineers, principally by Mr. A. Cumming, an uncovenanted District Revenue Surveyor in the Company's service, with the aid of native assistants.

Before, however, describing the drawings, allow me to point out as succinctly as possible, who the men were who erected these wonderful buildings. You will recollect that Mahmoud of Guznee's famous raid to Somnath was the first great Mahomedan invasion of India; he, however, made no permanent settlement on our side of the Indus, and it was not till two centuries later that Kutub-u-Deen established himself at Delhi, in the year 1206; he was the actual founder of the Patan dynasty, which lasted for nearly three centuries. Towards the end of that period, like all Eastern dynasties, it tended to decay, and the remoter provinces were enabled to assert their independence, and establish themselves as separate sovereignties, first in Bengal, then in Goozerat, so that in course of time six separate kingdoms were established in the Deccan, or within the limits of what is now the Bombay Presidency.

One of the last and least of these was Beejapore, which became independent in the year 1501, under Yusuf Khan, a son of Amurath II, of Anatolia. The first three or four kings did nothing very remarkable, and are buried at Gooke near Sholapore, but on the defeat of Ramraj, of Vyjanuggur, their successors became rich and powerful, and adorned the capital with the buildings illustrated in the drawings, during the century that elapsed between that event and the final subjection of the kingdom by the Tyrant Aurungzebe, in 1685.

THE FOLLOWING ARE THE PRINCIPAL DATES WHICH IT IS REQUISITE TO BEAR IN MIND WITH REFERENCE TO THE PRESENT SUBJECT :—

				A.D.
Mahmoud of Guznee				997
Conquest of Delhi (Kutub)				1206
Baber				1494
Mogul Dynasty established				1554
1. Guzerat		1319	1584	
2. Malwa		1387	1568	
3. Kandeish		1370	1596	
4. Ahmednuggar		1490	1607	
5. Golcondah		1512	1672	
6. Beejapore		1489	1660	
Ibraham II	1579			
Muhammed	1629			
Ally Adil Shah	1660			
Aurungzebe				1658
Aurungzebe died				1707

The 74 drawings now sent home illustrate two Tombs, those of Muhammed and Ibrahim, one Mosque, one Palace, one Private Residence, and one Bowree or tank. You must not, however, suppose that these are all the buildings worth seeing in this remarkable city. There is no illustration of the walls of the citadel and town, the former 1¼, the latter 6¼ miles in extent, and with their bastions and gateways perhaps the most remarkable feature of the whole. There are no illustrations of the seven palaces within the citadel (one seven stories in height), which, as the residence of the kings, were the richest and most beautiful buildings; none cf the other tombs, mosques, and palaces of the nobles, which crowd every part of the city, and would require at least two or three times the number of the present drawings to make them intelligible.

The most remarkable building is the Tomb of Muhammed.* It consists of a square apartment, measuring 135 feet each way. At the height of 57 feet from the floor line, it begins to contract by an arrangement of pendentives, as ingenious as beautiful, to a circular opening of 97 feet; on the platform over the pendentives is erected a dome, semi-elliptical in outline but circular in plan, 124 feet in diameter, leaving a gallery more than 12 feet wide all round; the internal height of the dome is 175 feet, the exterior to the apex 198; the general thickness is about 10 feet; at the apex, however, it is nearly 18 feet; yet, if the tradition of the place can be depended upon, it was built wholly without centering.

The most ingenious and novel part of the construction of the dome is the mode in which the lateral thrust is counteracted. In the Pantheon, and in European domes generally, this is counterbalanced by a mass of masonry in the haunches, as is also the case in bridges. This mass, however, entirely destroys the outline and is, to say the least of it, a very clumsy piece of masonry; here the object is accomplished by hanging the weight inside: the massive pendentives having a tendency to fall inwards act as ties, and effectually accomplish the object without the possibility of derangement to the structure, as from their arch form, they are perfectly stable in themselves.

---

* The Gol Goomuz.

The external ordinance of the building is as beautiful as the internal. At each angle there is an octagonal tower of 8 stories, simple and bold in its proportions, and crowned by a dome of great elegance. The lower part of each face is plain and simple, pierced only with such openings as are requisite to admit air and light in that climate, and they are not a tenth of what would be required in ours.

At the height of 83 feet, a cornice projects to the extent of 12 feet, nearly double what the boldest European architect ever attempted, and above that an open gallery gives lightness and grace to the whole structure. Above the gallery is an ornamented band of fretwork, which is surmounted by a battlement of great beauty, relieved by eight smaller minarets, two on each face.

On comparing this with other domes, it will be seen that it is the first in area. It covers more ground clear of support, than any dome or vaulted roof in the world; while it is of more difficult construction, being placed over a square hall instead of a circular drum. Considered, therefore, either as a mechanical or as an artistic form it must rank among the first, if, in fact, it be not the most beautiful as well as the largest domical building yet erected in any part of the world.

DIAMETER OF PRINCIPAL DOMES.

Pantheon, Rome	142 feet.
St. Peters, ditto	139 „
Sta. Maria, Florence	139 „
Tomb of Muhammed, Beejapore . . .	135 „
St. Paul's, London	112 „
Sta. Sophia, Constantinople . . .	107 „
Church at Darmstadt	105 „

PANTHEON.		TOMB OF MUHAMMED.	
Internal area of circle .	15,833 feet.	Internal area of square .	18,360 feet.
Internal area with recesses	19,086 „	Internal ditto with recesses	19,371 „
Whole area of building .	27,157 „	Whole area of building .	24,964 „
Area of supports .	7,477 „	Area of supports .	5,593 „
Ratio of supports to area .	·363 „	Ratio of supports to area	·446 „

Tomb of Ibrahim.*

The other tomb—that of Ibrahim—is a much smaller than that just described, being only 116 feet square over all, and 114 in height to the top of the crescent, but it makes up in richness of detail and in elegance of design for this difference in dimension; and I am not sure that many would not prefer the Corinthian exuberance of this tomb to the Doric simplicity of its great rival.

In plan it consists of an internal apartment, 40 feet square by 35 feet high, covered by a stone ceiling flat in the centre, and slightly coved at the sides; a constructive problem almost as difficult as the great dome of Muhammed's tomb itself, but which has been most successfully accomplished. This apartment is surrounded by a double verandah, flat roofed throughout, and supported on square pillars, with bold and beautiful capitals. Though the walls of the central apartment are plain and unornamented, every part of the exterior is covered with the most elaborately carved ornaments, generally of Hindoo parentage, but interspersed with inscriptions from the Koran, so numerous, that it is said the whole of the sacred book is inscribed on the walls of the tomb. The windows, too, have pierced Arabic inscriptions for tracery, and the whole is coloured, gilt, and finished with a profusion of labour and intricacy of design, which puts the Alhambra and all Western buildings to shame, and can only be found in the far East.

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* The Ibrahim Rozah.

Above the central apartment is one covered by a dome of beautiful proportions and design, though merely meant to occupy the space required to give the necessary height to the dome externally, which, combined with the minarets surrounding it, makes up a group of graceful objects as playful as anything in Gothic architecture, as beautiful in grouping, and far more elaborate in detail.

Attached to all these buildings are mosques and gateways, the former larger than the tombs themselves, and as beautiful in style; but of these we have, unfortunately, no drawings or details.

The next building is the Jumma Musjeed, or great mosque, the Cathedral of the city. It consists of one great apartment, divided by five aisles in one direction and nine in the other into forty-five squares, nine of which are covered by the great central dome, 75 feet in diameter; the remaining thirty-six having each a small flat domical ceiling of great beauty. This building is 258 feet by 144, in front two wings project 188 feet, so as to enclose with the mosque three sides of a court yard of those dimensions. It, no doubt, was intended to enclose the fourth also by a gateway worthy of the mosque and of its position in front of the building. Though commenced by one of the earlier kings of the dynasty, it was left unfinished when the race was overthrown by Aurungzebe. The architecture of the building is remarkable for the elegant simplicity of the details and the beautiful proportions of the parts; and though it has nothing so striking, for size and construction, as the Tomb of Muhammed, or so rich as that of Ibrahim, it may fairly rank as one of the best of the simple and pure style of architecture which so frequently characterizes the early mosques of the Mahomedans in India.

As I before mentioned, the only palace illustrated in the collection is the Ashar Moobaruck, situated just outside the ditch of the citadel. It consists of one block of building, 100 feet by 135. In front is a great verandah, 38 feet deep, supported by four wooden pillars; behind this are various walls and apartments, two stories in height. It cannot pretend to anything like the architectural splendour of the three buildings just described, but is an interesting illustration of the mode in which Indian architects employed wood in their construction. The difference of spacing, of construction and detail, is everywhere apparent, but every thing is as appropriate, and in good taste, as in the buildings of stone.

The building is now used as a relic shrine or temple, being said to contain two hairs of Mohamed's beard, and it is singularly interesting, as a means of comparison with the buildings of Persia; but on this it would not do to enter on this occasion.

The private dwelling* these drawings illustrate is, though small, not the least interesting or beautiful. Although only 24 feet square on the plan, and 50 feet in height, it must have cost more than the building last described. Every part of its walls, floors, and partitions is built of stone, and some parts of it are carved with an elaborateness only to be found in India; still, as will be observed in the drawings, the architects were not afraid of plain surfaces, all the walling being entirely without ornament, which gives value to the more enriched details. We have no buildings in Europe which can compete with this. Such a one as Roslin Chapel, for instance, is coarse and plain in comparison; and except the shrines in the interior of our Gothic Cathedrals, nothing is ornamented to the same extent; but they, of course, are comparatively small, and are objects of internal, not external architecture. Indeed, words can convey no adequate idea of such an edifice as this; but fortunately the drawings are so carefully and beautifully executed as to leave nothing to be desired in the way of explanation.

* The Mehturee Mahal.

The story of this building is curious and characteristic. It is said that an astrologer persuaded the first Ibrahim, who was a weak prince, that the only way to escape a great impending misfortune, was to give a large sum of money to the first man he should see on rising on a certain morning —meaning, of course, to be himself the man. The king, however, troubled with the idea of his destiny, rose earlier that morning than usual, and the first person he saw was the mether, or sweeper, who is always in India a man of the lowest caste, and who was performing his menial office at that early hour; he in consequence got the money, and employed it in building this gateway, which was to lead to a dwelling and mosque in the court-yard within. Only this part of the design was, however, completed; but enough has been done to shew that, though his caste was low, his Hindoo blood led him to appreciate elegance with even more taste than his lordly masters, which he has done in the richest and most elegant specimen of architecture in even this wonderful city.

The remaining building* illustrated by these drawings is a bowree, or large tank, surrounded by stone steps, and with arches and gateways, a form of architecture peculiar to India, and interesting, as showing how any object may be made architecturally beautiful, whatever it may be. The present is neither so large nor so splendid as other specimens that might be selected. Its form and details, however, are as elegant as those of the other buildings of the city, and well worthy of a careful examination.

Such, then, are six of the buildings of Beejapore, selected out of the forty-one mentioned in the plan of the city; but even that does not include all, for the suburbs which are beyond its range, contain both palaces, mosques, and tombs well worthy of attention; and although these six may be considered as the principal buildings, there are many others as rich and ornate; and although perhaps on a smaller scale, still, in the aggregate, as worthy of illustration — so that it would require many more drawings to make up a worthy representation of the architectural splendour of the city of Beejapore; and when you recollect that this is only a provincial city, once the capital of an ephemeral dynasty, which hardly existed independent for more than a century, you will easily understand that they do not exaggerate who speak in glowing terms of the wonders of the imperial cities of Agra and Delhi, and of the ruins still to be found in other provincial capitals, and assert that there are architectural forms in India well worthy of the attention of the architects of Europe.

Mr. Papworth, Fellow, did not perfectly understand the manner in which Mr. Fergusson seemed to think that the walls of the Gol Goomuz were relieved from the outward thrust of the dome, and would feel obliged by some further explanation on that point.

Mr. Fergusson, in explanation, made a rough sketch, illustrating, first, the tendency of domes and arches to break outwardly; secondly, the mode in which that tendency was counteracted in the Pantheon by a mass of masonry externally; and thirdly, the way in which it appeared to him that the same object was accomplished in the Gol Goomuz by a corresponding mass of pendentives internally. The effect of the latter arrangement, drawing the mass inwards, was equivalent to that of the external masonry opposing outward pressure in the case of the Pantheon.

Mr. Papworth pointed out the object of loading an arch or dome at such a point as in the Pantheon, viz. to prevent its spreading *at the haunches;* but the difficulty he felt was as to the *upright walls* of the Gol Goomuz. It appeared to him that the beautiful arrangement of the pendentives in that building was merely ornamental, and had nothing to do with the construction or the statics of the dome, which latter was a solid and independent construction.

Mr. Donaldson, H.S.F.C., considered that the weight exercised by such a dome *at the springing* would be so great as to thrust out the walls but for the weight inside provided by the pendentives, which acted as a counterpoise He did not understand Mr. Fergusson to allude to the construction of the dome itself, but to the counteracting effect of the pendentives.

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* The Taj Bowree.

Mr. Fergusson explained that the arrangement referred to gave the dome a basis so solid that it could not thrust the walls outwards; a mass, indeed, upon which the dome rested as it would upon the ground.

Mr. Donaldson suggested that the form and substance of the dome were such as would ordinarily be deemed contrary to sound construction, and inquired whether there was not something in its internal construction, (either timber or a highly adhesive mortar) to account for its holding together.

Mr. Fergusson said that was not the case. The dome was entirely of brick and mortar, and the common tradition of the place was, that it was built without centering of any kind, merely by the aid of a pillar in the centre, with a moving arm or guide-pole. He knew that small domes were thus erected in the East at the present day.

Mr. Thompson, Fellow, considered that Mr. Fergusson's explanation of the principle of construction was perfectly clear, and that the arrangement described was exceedingly novel and ingenious; adding (as he conceived) three times their original resistance to the otherwise slight and insufficient upright walls.

Mr. Fergusson further stated that the mass of masonry in the pendentives was probably equal in weight and mass to twice that of the whole quantity of brick-work in the dome, thus effectually resisting any thrust from what was in fact the smaller mass. The angles in some respects resembled fan-groining, and it would be observed that the dome stood in fact nearly *within* the *inner* side of the upright walls.

The Chairman, Mr. F. C. Penrose, V.P., observed that Col. Sykes was present, and would probably offer some remarks upon the subject. Perhaps he would be able to state whether the pendentives were corbelled inwards with horizontal joints, or with radiating joints, because the principle of the construction would depend very much on that point. The adoption of the arch principle with radiating joints, and with key-stones in the enormous open ring beneath the dome, would defeat the object, and help to press outwardly; whereas if the mass were corbelled inwards with horizontal joints, an effectual power of sustaining the dome would be obtained.

Colonel Sykes, Visitor, begged in the first place to disclaim a large portion of the praise bestowed upon him by Mr. Fergusson in reference to the drawings before the meeting. He had simply been the means of their appearance in this country, and the gentleman through whose zeal and taste the work was accomplished was Mr. Frere, the present Commissioner in Scinde. The position of that gentleman, as the successor of the late Rajah of Sattara, enabled him to give orders for the drawings, which had been executed by an European Officer of Engineers, with the assistance of some native artists, both Mahommedan and Hindoo. He (Col. Sykes) had himself spent a week or ten days at Beejapore in the year 1818, and examined the buildings represented with much interest and delight; but he did so only as an amateur, and was unable to answer the Chairman's question. He believed the drawings, however, were so perfect, that they would supply the information required. With respect to the use of timber, he observed that there might have been some employed in the *Mehturee Mahal*, which was a private residence; but the other buildings were entirely of stone, excepting the great Goomuz, which was of bricks united by means of the celebrated chunam which held them together with great tenacity. All the decorative work, carvings, windows, &c. were of stone enriched with patterns of the greatest variety and beauty, embracing indeed all kinds of forms except those representations of animated nature which were forbidden by the Mahommedan religion. He could not adequately express his admiration of the taste and elegance of design and harmony of colouring displayed in the works of India, from the most northern cities down to Beejapore, both Mahommedan and Hindoo. Beejapore was now a city of ruins, the spaces between these splendid buildings being partially cultivated, and the mass of the population living in the surrounding country.

Mr. Cockerell, Fellow, concurred with Mr. Fergusson in admiring the curious, novel, and highly interesting mode of construction which he had explained in the Gol Goomuz, and the effect of which might be easily understood, as providing a platform on which the dome might safely rest, although the walls below were comparatively slight. Before, however, they, as architects, could profit much from the construction of this dome, it was necessary to have many further particulars, in order effectually to compare it with the works of our own quarter of the globe, and especially with the great work of Brunelleschi. The *outline* of those oriental domes (differing as it did from that adopted by the great Italians) rendered them exceedingly interesting; and it would be very desirable, if possible, to pierce their walls, and ascertain whether they had any chain bonds or other similar contrivances, and in short to compare them minutely with the great dome of Brunelleschi. The latter (like the human dome, the skull) was a double construction, possessing solidity and thickness with comparatively little weight, whereas the dome now under discussion was solid throughout, rendering the weight enormous, and the structure much more difficult; although, at the same time, much less scientific. He hoped, therefore, that the comparison he suggested might be carried out. He begged to ask Mr. Fergusson whether he had found in these remains a school of ornamental art, such as might have arisen out of the school of the Arabs, who were so renowned for their beautiful geometrical combinations and exquisite taste.

Mr. Fergusson, in reply, observed that every nation which set out honestly to work out a problem in art, and to improve in every work on those which had gone before, had succeeded in producing a true and perfect school of art. It was thus with the Egyptians, the Greeks, and the Romans, as well as in Gothic, Saracenic, and even in Mexican and Indian architecture. The Hindoos and Mahomedans, when they began to build domes, built small domes; these were successively enlarged and improved till they attained the perfection now described. And in the same manner with ornamental art: the most beautiful details in the most perfect of these works could be traced back for centuries in their gradual progress from rude or clumsy mouldings. And it was remarkable that the Mahommedans in India had engrafted upon their own Saracenic style many features and ornaments from Hindoo architecture. Mr. Fergusson proceeded to explain that the peculiarly obtuse angle at which the pendentives cut across the apartment, had a great effect in reducing the outward thrust, which was not one-tenth so great as if they had been placed at an angle of 45 degrees. Moreover, the thrust was by this arrangement carried into the great pillars or minarets at the corners of the building; becoming practically *nil.* He could assure the meeting that the dome was a solid mass of brick-work. There were many ruined domes in India, which had fallen down, and in all cases they had been solid masses, the tenacity of the materials precluding all danger, unless the foundations gave way. He had witnessed in India the construction of a vaulted apartment 200 feet long and 110 feet high, with a span of 58 feet, similar to our own Gothic vaults, the vault being 10 or 12 feet thick. This was effected by raising a rude scaffolding in the centre, and forming a mould of the intended vault in clay, upon which they threw in masses of concrete. The heat of the climate soon rendered this thoroughly dry, when the scaffolding was struck, and the vault remained as perfect as possible, and would probably last for centuries, although there was not a single moulded stone in its construction. Many vaults in India, constructed apparently in a similar way, had lasted four or five centuries, and therefore the tenacity of material in the great dome at Beejapore was less surprising.

Mr. Baker, Associate, suggested that it might be a question of bond. If the bonding of the brickwork were perfect, the thrust would be very well resisted.

Mr. Fergusson concurred.

Mr. I'Anson, Fellow, expressed his sense of the obligations of the Institute to Mr. Fergusson for his admirable paper. Beautiful as the drawings were, they were evidently insufficient to enable an architect to reproduce the original works, and he confessed he did not understand the principles of that peculiar mode of construction which had been discussed. It was much to be regretted that this powerful country, with its immense possessions in India, had not done anything towards describing and illustrating these interesting monuments; a work which he felt sure would be gladly undertaken by many young and rising architects as a matter of study.

Mr. Donaldson highly eulogized the beauty, minuteness, and obvious accuracy of the drawings, and the amount of knowledge shown hy the mode in which the sections were prepared. He hoped, indeed, that the Institute would refer it to the Council to take such steps as they might think proper, with a view to induce the Directors of the East India Company to have them lithographed and published. He moreover thought it would be highly desirable if permission could be given to exhibit these drawings next year in Paris, where, he felt confident, they would excite the strongest curiosity and interest.

Mr. Cockerell fully concurred in the views expressed by Mr. Donaldson.

The Chairman stated that Colonel Sykes had kindly permitted the drawings to remain at the Institute till the next meeting, with a view to the further discussion of the subject; and he hoped on that occasion that some members would come prepared with plans and sections of European domes, in order to carry out the interesting comparison suggested by Mr. Cockerell.

Mr. Donaldson proposed a vote of thanks to Mr. Fergusson. His knowledge of the history of India, and his previous study of collateral styles of architecture, pre-eminently qualified him to do justice to this interesting subject; and the simplicity, and at the same time the vigour, with which he had brought it before the meeting, fully entitled him to their best thanks.

The Chairman had much pleasure in following Mr. Donaldson, by proposing a separate vote of thanks to Colonel Sykes for allowing the drawings to be displayed.

Colonel Sykes, in returning thanks, observed that the acknowledgments of the meeting were really due to the Directors of the East India Company, who deserved much praise for their liberality. The Museum of the East India House contained many other interesting objects, which might be made public with great advantage.

Mr. Donaldson and Mr. C. H. Smith, Visitor, confirmed this statement from their own experience, and the latter suggested that the members of the Institute might, with great advantage, devote a morning to the inspection of the drawings, &c. in the Museum.

The votes of thanks were carried by acclamation.

ELMES' TESTIMONIAL.

Mr. Cockerell said, that by the permission of the Council, he begged to lay the subscription list of the Elmes' Testimonial on the table, and to invite the co-operation of the Institute in promoting its object, both as a recognition of the extraordinary merit of their lamented professional brother, and as a duty to the profession itself, so admirably sustained and dignified by his genius and labours. He then proceeded to point out some of the most remarkable features of St. George's Hall at Liverpool, in which he showed, by a comparison of the vaulted ceilings of Diocletian's and Caracalla's baths, that Mr. Elmes had exceeded the Romans, that he had equalled the greatest efforts of the art in modern Europe, and had surpassed every architectural production of this country in the present century. Mr. Elmes might be called a meteor in the architectural world: at the age of 23 he obtained the premium for St. George's Hall; at 24, that for the Assize Courts; at 25, he incorporated the two, and carried out the structure in the main, during the eight remaining years of his brief but brilliant life, which terminated at the age of 34, in Jamaica. The Corporation contracted with their architect to give him 5 per cent. on his own estimate of £ 97,000., including the premium in the competition, and all travelling expences, no addition being made for the many extras from his designs, ordered by themselves, in carrying out the work. At his death, 5 per cent. on the amount of work done up to that period, was paid to his widow, and a present of £375., in consideration of drawings, &c., and the unhappy circumstances attending his premature decease. On these profits he had honourably effected the insurance of his life, and had provided for the necessities of his father; but owing to his informality in not arranging conditions with the insurance office on leaving the country, half of the insurance was forfeited, leaving to his widow, a lady of great accomplishments, and his orphan son, an income of only £ 62. per annum, to which her mother's protection, and her teaching music, made some small addition. Under these unhappy circumstances, it had been his (Mr. Cockerell's) obvious duty, as his successor in the work, and the wish of his friends and admirers in Liverpool and elsewhere, to raise the means of adequate provision for the relict of so admirable a man, and he had to report that about £ 618. had already been raised by the people of Liverpool, and about £ 492. by architects, engineers, and some noble lords, and strangers. He was sorry to say that, hitherto, some of the most conspicuous names of the merchant princes and capitalists of the richest commercial mart of England, Liverpool, had not been added to the list, though he did not doubt that they would be in due time. A noble Lord, politically connected with Liverpool, had at first declined to subscribe, because he considered, "that the people of Liverpool, so honoured and benefitted by the work, would monopolize the right of providing for the widow and orphan;" and some of our own profession, conspicuous for liberality, had hitherto declined from the same cause. Mr. Cockerell looked, however, confidently to the countenance which the Institute would give to the testimonial, not as a moneyed corporation, for they had no means at their disposal, but as a body of individuals always alive to such considerations, and second to no Society in the metropolis for true liberality and enlightened patronage of genius and merit.

The meeting then adjourned to Monday, December 11th.

Correction in the Discussion, November 13th:—page 4, line 22, *for* Edward the Third, *read* Henry the Third.

ON THE GREAT DOME OF SULTAN MUHAMMED'S TOMB AT BEEJAPORE.

Being a Discussion (in continuation) held at the Ordinary General Meeting of the Royal Institute of British Architects, December 11th, 1854.

Mr. Fergusson, Associate, said—As there are no doubt many persons present on this occasion who were not here this day fortnight, and consequently did not hear what then passed, I have been asked to recapitulate briefly what I said, not with regard to the general subject of the architectural splendour of Beejapore, but with especial reference to the artistic and constructive merit of the great Dome of Sultan Muhammed's Tomb, to which the discussion this evening is to be confined.

Before doing so however allow me to go a little back in the history of domes. The first great example which it is necessary to quote is the Pantheon, which is raised on a circular apartment or drum, as were all the earlier domical tombs of the Etruscans and Romans. The inconvenience of this form was however early felt, and an octagonal one was adopted, and then a square, the angles of which were cut off, so as to form an octagon internally, and then the triangular blocks in the angles were hollowed out into great niches, so that very little space was lost. In course of time the head of the niche became an arch, springing from wall to wall, and so formed what may be called the Roman pendentive. It was generally brought down to the ground by a vaulting shaft, but that was of little or no constructive use.

The Byzantines made an advance on this by filling up the angles of the building with a bold bracket springing from each angle, with a vaulting shaft in the corner, which gradually extended forward till it formed the octagon at the springing of the dome.

The Saracenic architects used both these forms; though it may perhaps generally be asserted that in the western world they preferred the Byzantine; in the eastern the Roman pendentive. In India there are some noble examples of both classes. In that country, after having produced the octagon they generally cut off the angles again, so as to produce a polygon of sixteen sides, and in large examples repeated the operation, so as to have one of thirty-two, which is practically so near a circle that a dome can be placed on it without difficulty or apparent abruptness. But besides gaining this floor for the dome, several other points have to be attended to, and the first is, that externally the dome should spring from within the line of the walls; internally, the same line should be carried up, but externally such an arrangement would be weak in the extreme. In small buildings this is easily got over; a wall 6 feet thick allows a dome 3 feet thick to be placed 3 feet from its face; and by thickening the wall another foot or two, the required apparent stability is obtained. In larger buildings this is generally effected by an outer verandah, or range of apartments, which, added to the internal square, gives the requisite base to the dome.

At Beejapore, however, and in domes of such size, neither of these expedients was available. It would have required walls 15 to 20 feet thick had the first, and an enormous increase of height, had the second expedient been employed, or the building would have appeared squat and ill proportioned. The architects therefore adopted the plan exemplified in the drawings which I will call, if you please, the Beejapore Pendentive, which consists in carrying the Roman arch not from one point of the octagon to the one nearest it, but to the next: by this means a much more extended floor is obtained for the dome, and though of the same thickness as the walls, it can be brought as far within their line as appearances require. A second advantage of this construction is that the architect obtains a mass of masonry so much larger than the whole mass of the dome, that no motion or disturbance of its equilibrium can affect the support on which it stands, and consequently if there be not some most glaring inherent defect in the dome itself, it would stand for ever. A third advantage is that the mass is so placed that its tendency is to fall inwards, or in other words, to draw the building together. This is easily and surely counteracted by the arch form of the circle; but at all events outward motion is impossible, and that is the one thing to be avoided in the present instance. A fourth advantage gained by this construction is the great gallery which surrounds the base of the dome, nearly 13 feet in width, which is not only a noble feature in itself to a person walking upon it, but when seen from below, has all the effect of the boldest cornice in the world—which it is—and conceals the springing of the dome from every point, so that it seems like a vast vault of unlimited extent spanning the whole space below with a simple grandeur, which, so far as I know, is unrivalled in any part of the world.

On the last occasion several parties objected to the construction of the dome as unscientific, and had the discussion taken place at the Institute of Civil Engineers, the issue should have been taken on that point. Here, we ought rather to ask, is it artistic; according to India notions, it certainly is, and so I think all will agree who see how exquisitely proportionate it is to the mass it covers, how solid, and, if I may so express it, solemn its outline is, and consequently how appropriate for a tomb. That it is unscientific according to our European notions I willingly admit, as it is thinnest at the springing, where it is 9 feet 6; a little above this it is 10 feet 6, and carries a thickness of rather more than 10 feet to the apex, where it is 18 feet; a mode of construction exactly the reverse of ours, and perhaps of what it should be, if the question was only how the place could be roofed with the least possible number of bricks. That its science is sufficient is proved by the fact that it has stood two centuries uninjured, indeed, barring earthquakes and pepul trees* it would with moderate care stand for ever.

The fact is the Indians knew so well the capabilities of domes that they could play with them, and have no fear of their falling; we in Europe are afraid of them, and have never fairly tested their capabilities.

Sir Christopher Wren shirked the question entirely by introducing a cone, constructively no doubt the best form for his purpose—artistically the worst, as he confessed by hiding it both internally and externally.

Brunelleschi halved the difference, adopting a form slightly curved externally. The octagonal form of his plan rendered this tolerable, though not beautiful; for a circular dome it would be unbearable.

Michael Angelo did better, and produced a bolder construction and a far more artistic form, and had he been able to secure his base constructively, without iron ties, his dome might have been eternal. Had either he or Wren known for instance of this Beejapore mode of placing a mass at the springing, sufficient by its inertia to resist any movement in the vault, and to convert all outward thrust into inward pressure, they might have constructed far larger domes far more solidly than they have done. I trust the subject may excite some interest, for I feel, so far at least as my own personal convictions are concerned, that the dome is by far the noblest feature which man has conquered from nature, for building purposes. Externally its grandeur far exceeds that of Gothic steeples or towers, or any other form we are acquainted with. Internally it covers larger spaces than any other form of permanent roof, and in its simple sublimity far surpasses all the elaborate littlenesses of Gothic vaultings. It is also a true roof, which no Gothic vault is, the latter being merely a sham ceiling under a wooden roof, like the dome of St. Pauls; but when its construction is understood, a dome requires no such covering, but ornaments the building it surmounts both externally and internally. It is also, I am convinced, the easiest constructed of all true roofs; and whether it is thin as the dome of earthen pots of San Vitale, or constructive as that of the Pantheon, or bold as that of the tomb of Muhammed, it stands with ease and lasts through ages, and with our science may be made as eternal as the pyramids.

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* Pepul trees (*ficus religiosa*) are the great enemies of buildings in India. They grow *par préférence* on brickwork, and if once they get their roots into a crevice, they split the strongest wall in a very few years, and tear domes especially to pieces. J. F.

Before sitting down I may allude to one other dome, that of Sta Sophia at Constantinople, of which at last some authentic particulars have been obtained in the work of Salzenberg of Berlin, who, taking advantage of the scaffoldings erected by Fossati for the repair of the building, measured carefully every part of it, and has just published the result of his researches in one of the most beautiful works produced for a long time, from which the section on the wall is copied. From this it appears that the diameter of the drum of the dome is 100 Prussian feet, or 102 feet 11 inches English, but the dome itself is 4 feet more, or 107 feet in diameter. It is constructed of forty ribs, projecting each 2 feet, which die away towards the centre, leaving about one-third of the dome perfectly plain. The form is segmental, 45 feet 6 in height, and described consequently from a point about 8 feet below the springing. Round the base are forty windows, which throw in a flood of light; and altogether its appearance internally is as beautiful as any I know of. Originally it was even flatter than it now is, but being in that form beyond the constructive power of its architect, it fell in, and the present form was adopted; but even then the architect tried to keep it as low as possible, judging correctly, that the flatter it was the greater would be its apparent size, and also that of the floor it covered, and of all the parts around it. To obtain these internal advantages however, the architect sacrificed the exterior entirely, and it is on the outside perhaps the ugliest dome ever constructed. But the same remark applies to the whole church. No pains whatever seems to have been taken with the exterior, though every part of the interior is designed with the greatest care, and ornamented with the most profuse liberality.

These correct details being added to our previous small stock of knowledge regarding Sta Sophia, must be considered an immense gain to architectural science, and connected with what we know of the dome at Beejapore, will open, I trust, a new era in the science of dome building.

In reply to questions, Mr. Fergusson again stated that the dome at Beejapore was constructed of brickwork without centering, that the courses of the pendentives were not horizontal, but radiating, and that the mortar was made of the common lime of the country, which was very good. In India such buildings as the tomb of Muhammed probably took twenty years in their construction, out of which not less than three or four years would have been occupied on the dome.

The Honorary Secretary read a communication from Mr. Penrose, V.P., to the following effect: It will be seen, in the section I send of Metz Cathedral, that the wall above the vault overhangs to some extent, and also (as in all the old vaultings which I have examined) that the courses are carried up horizontally to a considerable height, thus corbelling out to meet the thrust, and opposing to the outward pressure of the vault a tendency in the wall to fall inwards. The rough diagram on the opposite side will explain my meaning better. 1st. Considering the wall by itself. The tendency of the overhanging mass is to fall forwards in a direction contrary to the thrust of the vault. 2nd. And considering the vault by itself. As practically there is seldom any chance of the voussoirs sliding upon one another, the horizontal pressure at the crown of the vault acts by means of a continuous lever about the fulcrum, at the lowest radiating joint. Had the radiating joints extended to the springing, this fulcrum would have been at the springing, and not only would the thrust of the vault been greater, but the advantage of the counteracting pressure already referred to would have been lost.

The advantage obtained in the construction of the Indian vault is an interesting variety, but the same in principle. The fulcrum of the great dome is at its base inside, and the inward tendency of the great corbel, which is formed below the great arch, instead of above it, as in Metz Cathedral, opposes itself to the outward thrust. I think that the curious arrangement of the arches which seem to support this great corbel, as I have called it, is meant to amuse the eye, and has very little to do with the question of equilibrium. It does not appear to me that the great dome itself is worthy of much commendation, except it be that a great thickness of material is useful to exclude the heat, but which a hollow construction, which such an architect as Brunelleschi would have advised, would have done much more efficiently. I think that while we admire the happy arrangement of the lower part, we cannot call the whole construction scientific, which would imply that thought had been well bestowed on every part.

Mr. PAPWORTH, Fellow, stated, that as to the principles of the construction of the great Mosque in question, he would preface his two chief points of consideration by saying, that he believed there was no one present capable of pointing out any published work on domes which had any authority whatever, and that, therefore, if his views were mistaken, they must be imputed to unintentional ignorance: at all events, he would make the assertions that a dome was not an arch, and that domes were not governed by the same laws as vaults; at least that was what he meant to lay before the meeting for its examination and investigation. He reserved the right of allowing certain exceptions, into which he should not then enter, but be satisfied with calling the attention of the meeting to the question of the scientific construction of the dome and its pendentives.

He would begin his own remarks with the pendentives. It seemed that A B C D being a square (say of 100 feet), and E F G H the diameters, F G deducted from A D giving the point K, and the points L M N O P Q R being similarly found, then the common pendentives in K L, &c. were more scientific and practically useful than the pendentive of the Gol Goomuz formed on the intersecting lines P K, K M, O K, L, &c.; for the wall, if 7 feet thick, which was about the proportion to 100 feet adopted at the Gol Goomuz, would in the case of K L give a pier for thrust 49 square feet in area at K and L; but in the case of K P, 119 square feet at P, and 21 square feet at K. The lengths of K L would be 64 feet, and of K P 86 feet; therefore half the arch on K L, equal in base to 32 feet, would thrust on a pier of 49 square feet in base, while half the arch on L N, equal in base to 43 feet, would thrust on a pier of 119 square feet in base, while the other half, or 43 feet, would thrust against a pier of 21 square feet in base; and he would assume as a rule in building that equal thrusts came best on equal piers, if economy in materials was to be considered a merit. He hoped for an explanation of the peculiar merit supposed to be displayed by the principle of the pendentives which had been described as adopted in the Gol Goomuz.

Mr. FERGUSSON replied, referring to the drawings and making explanatory sketches on the board, if you had to choose between *this* arch K L, and *that* K T, it would be so; but *this* pier L, does not only resist the thrust of *this* arch M L, but of the arch L N coming from *here* (referring to sketch). There are arches abutting upon every pier. There is a pier *here* L, which cuts the thrust to A *so* (sketching), and *this* pier A, has to support *this* O K, *that* N L, and the others P K and M L. All these thrusts are crossing one another. It is in the complication of these arches and of the vaults, of which the arches referred to by Mr. Papworth are only the outline, that the stability of the structure has been acquired.

Mr. PAPWORTH still considered the explanation unsatisfactory, as the pier L had to receive the thrust of half that arch K L, and also of the portion of the dome which would rest upon it, &c.; but in the Gol Goomuz instance each two portions of wall, N and L, took their own portion of the thrusts from the arch L N, and each half of that arch seemed to have an additional weight thrown upon it at each intersection, besides the fair share of the weight of the dome which would rest upon it, &c.; it therefore was still more desirable that the piers K and L should be as nearly equally solid (being necessarily in opposed walls) as possible, and if L was strong enough for K L, P was far too strong for K P, or if P was only strong enough for K P, the pier L was far to weak for K L.

Mr. **Fergusson**—If a certain mass has to be supported inside this building on arches, it must rest somewhere. The question is, where is it best that it should rest; at these points A B C D in the wall, or at an angle of 45°, as K L M P N Q R O.

Mr. C. **Fowler**, Associate, said it appeared to him that in the construction in question there were two forces acting in a certain direction upon a certain point, and the result of those two forces, supposing them to be equal, must be such as to produce a force very nearly, if not directly, at right angles to the wall. He would also ask whether the wall was thick enough to allow the two forces to be resolved within it, and whether the corbelling was so constructed as to allow the dome to be within the external wall.

Mr. **Fergusson**.—It is a complication of arches.

Mr. C. **Fowler** thought too much stress had been laid upon the effect of the towers at the angles, as buttresses.

Mr. **Fergusson**.—The great mass of the body is in the angles.

Mr. **Tarring**, Fellow, made some observations on the question of construction with respect to the pendentives.

Mr. **Fergusson**.—There is a complication of thrusts, which assist one another.

Mr. **Papworth** expressed himself perfectly satisfied, as all the gentlemen who had spoken appeared to coincide in his views. Mr. Fowler's remarks had embodied points on the resolution of forces which he himself had not intended to open, as there was some difficulty in going into such questions in a mixed meeting. Mr. Papworth then entered into calculations on the causes of the stability of domes, showing that in domes of equal thickness the upper half of each gore was only one-third in weight of the lower half, and adduced the possibility of loading the crown to a certain extent; producing a series of drawings of domes, constructed upon principles which ought theoretically, if they were arches, to lead to their failure, but which had nevertheless proved perfectly sound; his views being fortified by Mr. Fergusson's concurrence as to the absence of examples of failure where the bases were stable. He then alluded, with his reasons for non-concurrence, to suggestions that the dome of the Pantheon at Rome had been built on the principle of a bridge, *i. e.* of an arch; that it was impossible to plan a large dome without great thickness of walls, *i. e.* greater than sufficient to bear the weight and its consequences; that it was necessary for the exterior of a dome to stand flush with the wall of the building to which it belonged; that it was desirable to append heavy corbelling to the inside of the wall to counteract the thrust of a dome, with special reference to some circular tambours, of which he exhibited sketches; to the supposed unnecessarily great weight on the top of some examples; and to the supposed beauty of principle exhibited in the dome of Sta. Maria, at Florence, which he characterized as a piece of octagonal vaulting, and not a dome. He also explained that domes which had failed had not been supported on a stable foundation; that he saw great beauty in the idea of forming an eye in so large a dome as that of the Gol Goomuz, where the centre of the curve on each side of the section was in the edge of the eye; that the outer face of the springing of a dome might be within the inside of the square enclosing wall of the building; that if the principles of vaulting were applied, the waggon-headed section of the Gol Goomuz dome would not be expected, theoretically, to stand; and concluded by some observations in explanation of his illustrations, as to the requisite thickness of domes. His observations on these points were of considerable length, and excited much interest; but it is impossible to report them accurately without reference to the drawings.

Mr. Mathews, Associate, made some remarks in the belief that authors upon vaulting had considered the case of domical vaulting specially without reference to arches, and wished to impress on the meeting that their theories should be considered as formularized experiments ready for practical adoption.

Mr. Papworth observed, that the writers on arches had all, so far as he had seen, considered the dome as a case of vaulting on principles deduced from their experiments on arches, which was a mode repudiated by him; that the present theory of arches was so far from being practical, that it eliminated the question of cohesion in the materials; and that he would be glad to receive statements on that point which would assist his further investigation of the question of domical vaulting, before laying his views, in a collected form, open to public criticism.

Mr. Hesketh, Fellow, thought the dome in question was constructed partly by a system of corbelling, as any tendency to thrust with concentric rings might have been got over by constructing a portion of the lower part by such a system. The dome was probably constructed so as to have no lateral thrust whatever. It required only a vertical support; and the support it derived from the arches was real, as Mr. Fergusson had explained. He thought the great external projecting cornice had been made use of in carrying the thrust of the arches from their haunches to the four angular towers, which, it appeared to him, were so placed in order to receive it, and could not be intended for any other purpose. (Mr. Hesketh referred in illustration to the drawings and the sketches on the board).

Mr. Jennings, Fellow, observed that the question now under discussion was how the building had been so admirably constructed; but a preliminary question should be, whether it was really constructed on scientific principles or not. The thickness of the dome (10 feet) itself proved a want of scientific knowledge, and it did not appear to him that the form was the best that could have been chosen. The consideration of the pendentives was interesting, as affecting the question of the direction and resolution of forces. He could not see that the weight of the dome had increased the strength of the building, or that the thrust had been carried into the angular towers.

Mr. Fergusson said, that from its thickness the dome was certainly unscientific, and that, as an engineering point, it failed. It was an artistic and not an engineering dome. No contractor or engineer would propose now to construct a dome in the same way; but when a Mahomedan king was constructing his own tomb, he did not care for a million of bricks; the only point was to realize the artistic effect which was thought necessary. Whatever was the abstract power of the arches, it came across the great mass in the angles, which was immoveable, and could not be affected by any of the thrusts. In an artistic point of view it was one of the best domes ever constructed; but of course, if it had to be erected now, it could be done with half the materials.

Mr. Hesketh.—It would not resist a cannon ball.

Mr. Fergusson.—It would resist an earthquake.

Mr Scoles, H.S., referred to the section of a dome built under his direction in the year 1841. The span was 30 feet, the supporting walls 3 bricks thick, the springing line 36 feet from the floor. For the height of 3 feet above the springing the dome was formed by courses of bricks corbelled over; above that it was composed of four courses of plain tiles set in cement—in all 4½ inches in thickness. The construction had fully answered his expectations.

The Chairman, Mr. T. H. Wyatt, V.P., intimated that it was necessary to bring the discussion to a close. Mr. Fergusson did not insist that the great Mosque at Beejapore was a very scientific structure, and this was the point to which Mr. Papworth had called their attention. The thanks of the meeting were due to both gentlemen, and he (the Chairman) hoped that Mr. Papworth would be able to apply to a further purpose the interesting diagrams which he had submitted to the meeting.

The meeting then adjourned to January 8th, 1855.

ON THE SPIRE OF ALL SAINTS' CHURCH, CHESTERFIELD.

By W. G. Coldwell, Associate.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, January 8, 1855.

There are but few objects in this country that have excited more curiosity than the Spire of Chesterfield Parish Church. Its situation in the Midland Counties, near one of the principal railways, and adjoining that part of Derbyshire which is so much frequented by tourists, renders it much more familiar than many structures of greater architectural worth. Whoever sees it cannot but be struck with its peculiar outline, and curiosity is increased when on enquiring the cause one fails to receive a satisfactory answer. A local rhymer says:—

Whichever way you turn your eye
It always seems to be awry,
Pray can you tell the reason why?
The only reason known of weight,
Is that the thing was never straight.

This is one account concerning this spire, that has in the neighbourhood numerous supporters. Many firmly believe it was built crooked as we now see it. But there is another version far more singular, and which is, I think, more generally entertained, that is, that the spire is not crooked, but is perfectly upright and perpendicular. When in Chesterfield last summer, in a position about the best for observing the inclination of this spire, I enquired why it was crooked from a gentleman whose age and intelligence I thought would assist me in this investigation. To my surprise, he in the most positive manner, assured me it was "quite straight." He declined giving a reason why it appeared otherwise, and I could only regret that any one should make such bad use of his eye-sight. Within the last month I have had frequent proofs of the belief out of Chesterfield that this spire is straight, and strange to say, I find it even in print, with a reason assigned for its appearing otherwise. In Lewis's Topographical Dictionary we have a description of Chesterfield Church Tower being "surmounted by a lofty spire, which, from the peculiar mode of putting on the lead with which it is covered, though perfectly upright, appears in every direction in which it is viewed to incline considerably from the perpendicular." This version I have heard in the neighbourhood, with the addition as a conclusive argument, that if you walk round the spire it will always appear to lean in the same direction. The outlines on the walls sufficiently prove how far this oft-told story will bear examination. Any one here who has never visited Chesterfield, must feel astonished that such a tale could have obtained the circulation it undoubtedly has. The only reason I can assign is, that it has arisen from a natural love of the marvellous, and a desire to have here a wonder as great as any in the neighbouring wonderful district of the Peak.

I have endeavoured to ascertain the date of the erection of this spire, and also the earliest indication of its deflexion, but without any satisfactory result. Neither Leland, Stukely, nor Gough assists me. A writer in "The Beauties of England and Wales," says, "This church appears to have been dedicated in the year 1232;" but there is no particular allusion to the spire. In a work entitled "A Tour through Great Britain," published in 1753, there is the following concerning Chesterfield: "It has a fair church. The spire of its steeple being timber, covered with lead, is warped all awry." This gives us evidence of the existence of this inclination for upwards of a hundred years.

Having a thirty years' recollection of this place, and having heard these and other extraordinary tales concerning it when they had their full influence, I may be excused for admitting that previous to examining its framing, I thought it possible that there might be some foundation for the local belief that it was built crooked. I thought it just possible that the builder might have endeavoured to construct it in such way that the rolls at the angles, instead of being perpendicular, should twist slightly round, similar to what we occasionally find on the Continent, in stone pinnacles of the Flamboyant period, but the first glance internally was sufficient to eradicate such an idea, and I was obliged to discard this, the last remnant of early impressions, as having not the slightest foundation. The rafters are tenoned into a sill, and as these tenons are cut at right angles to the direction of their length, it follows that to have a proper bearing each rafter must be perpendicular, therefore this brings the definite conclusion, that the spire when built was built upright.

I hope it will not be considered I have occupied too much time with a matter that may appear of little importance. I should not have said so much, had not local prejudice been so strong, that this Paper might be considered incomplete if I had not alluded to it.

Internally this spire presents the strangest assemblage of timbers that can be conceived. The great deflexion from the perpendicular amounting to about seven feet, the twisting round of the upper part, which amounts at the apex to about 60°, the timbers which have been added when it was repaired, all these combined with the want of light, produce such a constructive Babel that I much question if its equal can elsewhere be found. On closely examining it, however, we are enabled to discriminate without much difficulty between what is old and what is of more recent date. The original construction is entirely of oak, while deal has been used in the repairs, and again the old work is morticed together and fastened with oak pins, and the new is secured with iron bolts and straps. With these particulars as guides, I have made out from measurements taken in September before last a section which shows all the timbers that remain of the original construction. It may be described as follows: Upon the tower walls, which are here 3′ · 6″ in thickness, rest four tie beams, each being of the scantling of 18″×9″; two of these rest on the north and south sides, and the other two are placed in the opposite direction, at right angles to the first, and notched on the top of them. At their intersection are four upright posts, 14′×9″ at the base, slightly converging inwards, which form as it were the posts of two queen trusses, and have struts, or principal rafters, 11′×6″, on all the eight sides. These posts are tenoned at the bottom into the upper tie beams, and at the height of about 18′ : 0″ are tenoned into the under side of a second set of tie beams. These second tie beams of the scantling of 15″×9′, have others crossing them at right angles, notched on the top of them, similar to those first mentioned. Posts 8″×8″ are tenoned into these, and these posts, at the height of about 17′ : 0″, are again tenoned into the under side of a third set of tie beams, which are of the scantling of 12″×11″. The same construction is repeated, and at an additional height of about 16′ : 0″ we have the inner upright timbers, or queen posts, tenoned into the under side of a fourth set of tie beams, 9″×7″. From the upper side of these last the four inner posts of diminished scantling rise uninterruptedly as far as the construction can be seen, or to what is called the "crow hole." At the level of each of these tie beams are struts, or principal rafters, also between the posts are diagonal beams, all halved and pinned together, and also a small scantling of timber placed horizontally, tenoned into the four sides of the upright posts. All these are shewn on the section with their respective scantlings figured. The ends of the tie beams are secured to angle or hip rafters, which at the base are of the scantling of 8″× 6″, and diminish to 5″×5″ at the top. The construction of this spire above the upper or fourth set of tie beams need not, I think, be particularly alluded to, the drawing shews it better than I can describe it; and, moreover, there has been no displacement in the timbers of this part but what can be attributed to causes below it. There are but few purlins to be found, those that exist are for the most part near the top, where, as I have just now observed, there has been but little change of form. We may conclude from their occurring below at irregular intervals that they have been more numerous. The rafters are of the average scantling of 4″×3½″; they are tenoned at the bottom into a sill, 15″×6″, at the level of the lower tie beams. At the base of the spire, tenoned into a lower sill, are rafters opposite the outer ones, as shewn on the section. The rafters are covered with stout oak boarding, laid horizontally, and upon this the lead rolls are fixed in the manner shewn in the elevations.

Whether between the year 1753, when, as we have already observed, this deflexion was noticed, and the beginning of the present century any examination was made we have no evidence to shew, but it appears that in the year 1817 great uneasiness was manifested in the town, and as danger was apprehended, several competent persons were appointed to examine this spire, and report upon its condition.

A local history to which I am indebted for some of my information, gives these reports in full but as they are lengthy, I will only read an abbreviation of them. The first is as follows:—

"We, whose names are hereunto subscribed, did on the 26th November, 1817, carefully examine the state of the wood in the steeple of Chesterfield Church, and find it not only in a very decayed state in some parts, but the greatest part of the principal timbers having a tendency to push the steeple towards the south, the top of which is now very far from being perpendicular over its base, which renders it necessary to prevent the top part of the steeple going further southward. If it be suffered to remain unsupported a few years, it will certainly become in a dangerous state, and it is very probable that it will fail at about the middle of the steeple, and fall towards the south or south west.

(Signed) "D. Hodkin.
"B. Tomlinson."

Another report is by W. Wilkinson, dated December 19, 1817. He says—"The timbers on the south, south west, and west sides, are very decayed. The rafters are out of the perpendicular as much as 1 foot in 6 on one side, and several of them about as much the other way. All are discontinued and broken, and consequently the perpendicular is destroyed. The general principles of its construction, as a piece of carpenter's work, is very bad and injudicious, and such as would disgrace the most inexperienced carpenter of the present age; but (he adds) I have observed this to be the case in most spires of ancient carpenter's work I have examined in different parts of the kingdom. The timbers are decayed;—it was originally built square. All spires are soon out of repair on the south, south west, and west sides." And he concludes by recommending the spire to be taken down.

E. W. Drury, December 20th, 1817, reports the spire unsafe and dangerous, the timbers decayed, the construction imperfect, and he recommends it to be taken down.

James Ward, of Sheffield, reports that he professionally examined it on the 24th January, 1818. It could be made to stand, with a little repair, for a century or more upon its present construction. There was no probability of its falling so long as the pillars upon which it stood were strong enough to bear or support its weight. With respect to dry rot, which was said to have affected the timber, he observed that there was no reason for apprehension on that score, as the wood was perfectly sound. He further stated that the foundation or base of the carpenter's work was firm and good, which rendered it nearly impossible that it should ever fall until the base itself gave way. He observed, lastly, concerning the steeple, which was strapped and well fitted together, that it was impossible it should ever fall if the necessary repairs were occasionally made in the wood work, because the base was firm and good, adding that there was not the slightest leaving from the shoulders, tenons, dovetails, or any other parts whatever, which convinced him that the steeple had never given way in the least since the day it was first erected, or it would have fallen down instantaneously. This report was corroborated by Joseph Ball, Francis Rogers, and George Bond.

It will be observed that none of these reports give any amount of the deflexion, but this omission we have supplied by the Rev. George Hall, who during his curacy of this church wrote a history of it. He says—“By measurement in January 1818, the ball on which the weathercock is fixed was found to lean towards the south 6′ : 0″ from the perpendicular of its base, and 4′ : 4″ out of its perpendicular towards the west, which gives a deflexion nearly south west of 7′ : 5″.

The reports just read gave rise to considerable debate at public meetings, which were held to consider them. Some wished the spire to be taken down, and some that it should remain; eventually it was determined to have it repaired as advised in the last report, and to these repairs I wish now to direct your attention, as their nature in connection with the present condition of the spire will enable us to examine the failure in its construction, and to investigate its cause. It will be observed in all these reports the spire only is alluded to. I examined carefully the tower, but was unable to detect the slightest indication of settlement; all the failure is in the spire alone.

It would be tedious to detail all the work which appears to have been at that time done; it will be sufficient to state that in addition to trifling repairs throughout, the bulk of the work was local, and consisted in stiffening and rendering stable, by what a ship carpenter calls fishing, one of the four series of upright posts which form the inner trussing of the spire, viz. that towards the south west. In some parts the original timber is completely cased up with the new, so that it cannot be seen. Some of the tie beams adjoining and in connection with them are also fished. For additional security a sill has been carried across the south west angle of the tower, and supports, in the manner shewn on the plan, two upright beams of the scantling, of $9\frac{1}{2}'' \times 9\frac{1}{2}''$, which are framed into a cross head near the uppermost tie beam, and in addition to having several struts are secured to whatever old timbers they come near. In one instance a tie beam has been cut away for the passage of one of these, and substituted by two half timbers, one on each side, and all are bolted firmly together. Struts or braces have been introduced on the inner face of the rafters in several stages opposed to the direction of the settlement. Queen trusses have been fixed under the lower tie beams, and a great number of other timbers have been introduced, for which it is difficult to assign a use.

It will be seen from these repairs, that, although Mr. James Ward, and those who signed the report with him, asserted there was no decay of importance, yet the first report was the more correct one. The timbers now on the sides towards the south, west, and south-west, are very much decayed, but be it remarked, that, although there are places where decay spreads over a large surface, it is more particularly at the joints of the framing. It is questionable if this decay alone would account for the great deflexion without a displacement of some of the timbers, and this, I am disposed to think, has taken place previous to the repairs, for among other information, the history of the neighbourhood gives us is the following—that Mr. Matthias Wilson, a cabinet maker, made a model of this spire, and said, “that one of the four upright beams being drawn out of its tenon had shrunk several inches, and this had caused the spire to have its singular leaning appearance.” That the spire is so much more decayed in one part than another, and on the weather side, can easily be attributed to the frequent presence of moisture and quick evaporation. Possibly the leadwork near the top of the spire was unsound, and the rain being admitted caused the decay which has been mentioned; and from the cabinet maker’s statement, it is possible that this decay may have been so great in one of the tie beams that it failed to retain the tenon of the upright post in its proper position. The manner in which the spire was built, with a number of joints one over the other, all forming receptacles for moisture, and hence for decay, hastened the result; and it can easily be imagined how through the shortening as it were of one of these columns, even without one of the timbers breaking away out of its mortice hole, the great weight above would descend, completely dislocate all trifling impediments, and have a tendency to fail as this spire has done, by going obliquely downwards and sideways, twisting every thing in any way pliable, and as all timbers were tenoned and pinned, they would not offer such a resistance as would counteract the great descending weight.

It would take up too much time to examine all the theories that have been promulgated; one has attributed it to the wood being warped through the action of the sun; another considered the weight of the lead had caused it; damage by lightning has been suggested, and to illustrate this an example was quoted of a stone spire at Linthwaite, near Huddersfield, being crippled through lightning; and the local history again tells us " an architect of some eminence had it plumbed and found it perfectly straight."

There is now but one subject I would mention, and that is my impression that the spire has settled, though in a trifling degree, since the repairs. I am led to this conclusion, first from the manner in which the old work in places appears to bind on to the new upright posts that have been introduced; secondly, from the great strain one of these new timbers appears to have, the camber being so great, that I believe the versed sine of the arc it forms in a length of thirty feet is upwards of two feet; and thirdly, from one of the diagonal braces being sprung, and the notches at its back to receive the rafters being an inch or two away from the rafters themselves.

In conclusion, I would observe that I do not wish it to be understood that this spire is unsafe; all I have wished to do is to lay before this Institute as correct an account of it as I have been able to put together with all its several peculiarities, so as to enable those gentlemen who have not seen it, to form an opinion for themselves, not only respecting its original construction and settlement, but also on the cause of such settlement and its present condition. That the stability of its original construction is gone I think must be admitted, and that it is upheld only by the timbers subsequently added. As to the sufficiency of these to sustain the imposed weight, personal examination alone can determine. On the first glance every one would condemn the spire as being really dangerous, but on a minute and careful examination, although the doubt as to the ultimate fall might not be removed, still the fear of immediate danger might be allayed. I hope what has been brought forward will be an additional proof of the old architectural axiom that the best constructive lesson is a failure.

Mr. Coldwell further stated, that the height of the spire itself without the tower, was 111 ft., the tower being a square of 23 ft. 10 in. inside, and the walls 3 ft. 6 in. thick. He believed the remarkable twist in the spire was caused by the shortening of the timbers of one of the series of upright posts, by which the whole superincumbent weight had been brought down.

Mr. Donaldson, H.S.F.C., observed that, as a general rule, timber would not shrink in length, and therefore there must have been some decay to account for the supposed shortening of the upright posts.

Mr. Coldwell explained that the ends of the timbers had decayed in one particular series of uprights more than in the others, and consequently the spire had settled downwards, obliquely and sideways. It was extremely difficult to ascertain the cause of the failure, as he could only measure in the dark with a two-foot rule, but he believed it to have arisen entirely from the decay of the timbers on one side only.

Mr. Donaldson remarked that the construction of the spire resembled the scaffoldings now used in buildings, being a series of vertical stages. He also alluded to a water tower at Buckingham, engraved in Nicholson's Carpentry, as illustrative of the question before the meeting.

Mr. Heneker, Associate, considered that originally the four posts or legs were all equal, and then the spire stood upright; but as soon as one became shortened, the others, not being compressible, twisted themselves, in order to correspond to it; but their not being able to do this sufficiently had given them a fall in one direction.

Mr. Pocock, Fellow, observed, as a singular feature, that the spire leaned towards, and not from, the quarter from which the prevailing wind in England blows.

Mr. P. C. Hardwick, Fellow, considered the admission of rain through a defect in the lead causing decay in the joints of the framing, was a very natural way of accounting for the failure of this spire.

Mr. Baker, Associate, inquired if there were any horizontal or wind braces in the spire.

The Chairman suggested that it would be advantageous if Mr. Coldwell could, at a future meeting, produce a larger drawing of the construction, in order that the subject might be more fully investigated.

Mr. Alexander, Fellow, concurred. It would be very desirable to shew the exact levels of the horizontal timbers all the way up, in order to ascertain whether the failure had occurred at the top, the middle, or the bottom.

Mr. Hesketh, Fellow, inquired whether there were any really good solid timbers in the hips, at the angles, which would help to support the spire.

Mr. Coldwell stated that there were timbers, nearly square, of 8″ × 6 at the bottom, diminishing to 5″ × 5″ at the top, in continuous lengths, abutting one against another. With regard to the horizontal timbers, they were out of level at every stage, but to what extent he had not been able to ascertain. He had not found any indications of old wind braces; though there were some which appeared to be insertions of deal of a later date.

Mr. Hesketh suggested that if at one stage one of the upright posts had sunk, either by the sagging of the tie beams or from decay, that would not in itself produce a twist, but it would occasion the spire to lean. If however in the next stage the same thing occurred at another angle, and in a higher stage at a third angle, and so on, he believed exactly the twist which now existed would be produced.

Mr. Coldwell said he should be happy to produce larger drawings at a future meeting. He believed the greatest amount of failure had been in the third tie beam from the bottom, where probably one of the posts had slipped out of the mortice, through decay. The timbers on the south-west side were decayed all the way down, particularly in the tenons and mortices; and he considered that the leaning and twisting of the spire was the natural result of their failure.

The Meeting then adjourned to the 22nd of January.

A DESCRIPTION OF SOME OF THE CONSTRUCTIONS NOW IN COURSE OF EXECUTION BETWEEN THE LOUVRE AND THE PALAIS ROYAL AT PARIS.

By T. L. Donaldson, Fellow, Hon. Sec. of Foreign Correspondence.

Given at the Ordinary General Meeting of the Royal Institute of British Architects, January 22, 1855.

The works now carried on at Paris under the direction of the Emperor constitute one of the most remarkable features of modern times: indeed I cannot recall to mind any period since the time of the Roman Emperors when works of such magnitude, magnificence, and essential utility were executed at once. It is not mere flattery to say, that, in all these public improvements he is the great ruling genius; everything originates with him, and the opinions of all the other authorities are subordinate to his decision, which is carried out, because it is supported by a well understood and very firm will. Many present have of course seen the continuation of the Rue de Rivoli, lately opened in connection with the buildings at the Louvre, which I described to a Meeting of this Institute at the beginning of last year. Having visited these works recently, I have thought it might be interesting to the members, if I were to communicate briefly some of the observations, which I made on the occasion.

Our Honorary and Corresponding Member, M. Hittorff, was so kind as to show me the lithographed contract drawings for the works, prepared by himself and his colleagues, and he has, with their sanction, very kindly contributed the copy on the table to this Institute. As they are drawn to the scale of $\frac{1}{50}$th, or very nearly $\frac{1}{4}$ inch to the foot, they are sufficiently large to enable us to understand and appreciate all the details. On the general plan of the locality are indicated the portion of the Louvre erected by Napoleon I. and Louis XVIII, and the new continuation, together with the garden beyond it, next the Colonnade of Perrault. It will be seen that the Rue de Rivoli has been greatly widened by the removal of a number of mis-shapen houses, narrow streets, and inconvenient thoroughfares. It has been supposed in this country that such alterations and improvements are effected at a much cheaper rate in Paris than in London; but the truth is, that on the contrary they are, if possible, more expensive in that city, and for this reason, that if an amicable arrangement for the purchase of the property required cannot be made, the promoters have not only to go before a jury, and buy up the ground-rents, the intermediate interests, and all the good-wills, as with us, but also to buy out the occupants of all the floors up to the very top; consequently there are numerous interests to combat, and compensation must be given to all the various parties carrying on their separate trades in the different stories. It is seldom in London that we have to treat with lodgers, who have such specific trade interests. Therefore, although the value of ground in Paris is not to be estimated at such a rate as £400,000. an acre, as it is for some plots in the City of London, the price to be paid is still very high, and ground is more valuable, generally speaking, than here. However, the property in question in Paris was bought up, all the persons interested were remunerated, and many retired with very good fortunes. The space gained has been used to widen the Rue de Rivoli, and carry it on beyond the Hôtel de Ville, and also to widen the Rue St. Honoré which runs parallel with it. The new Rue de Rivoli is only 72 feet 6 inches wide, exclusive of the arcade, under which there is a broad footway. This width is hardly sufficient for a grand leading thoroughfare, but it has been restricted by unavoidable circumstances, and by the old part serving as a guide. The Rue St. Honoré has been widened from 46 feet to 65 feet 6 inches, and it thus relieves the Rue de Rivoli of a portion of the heavier traffic, which would otherwise pass through it.

In consequence of the immense space occupied by the Louvre, it is necessary for the convenience of the public, to permit the passage of carriages through the building; and to facilitate this line of communication the Emperor has determined that the Rue Richelieu shall be extended to intersect the Rue St. Honoré and the Rue de Rivoli, and widened, so that there shall be a direct and easy access, adapted for an immense thoroughfare, from the Boulevard to the Louvre. The traffic of Paris has so much increased of late years, that it is difficult for vehicles to traverse the city, and the great principle adopted has been to provide wide thoroughfares from the stations of the railways, instead of those formerly required from the Barrières. The Louvre may be considered a focus in which these communications concentrate, consequently the thoroughfares in its vicinity are left spacious enough to enable the traffic to be carried on with all requisite facility. Thus it will be seen on the plan, that opposite the Palais Royal an open space is left, called the Place du Palais Royal. The large block of building, which adjoins it on the right of the spectator, is to be called the Hôtel des Chemins de Fer, or the Hôtel du Louvre.

The total frontage of the ground opposite the Louvre is 2030 feet; 620 being occupied by Streets, and the Place du Palais Royal; and 1410 by houses; and of this length 1285 feet are devoted to the Hotel, and other erections under the direction of Monsieur Hittorff and his colleagues.

It has been said that the French are not an enterprising people, and that they are deficient in mutual commercial confidence. We know, however, that great sums of money were formerly hoarded by individuals, who have discovered of late, that they can apply them to realise a good interest; and a Society called *La Société Immobilière*, or Freehold Building Society, has been formed expressly to cover this ground with buildings, at a cost of about £500,000. In order to accomplish this object within six months, they thought it necessary to appoint four architects; and they selected MM. Armand, Hittorff, Rohault de Fleury, and Pelechet. A Committee of Directors, meet twice a week. The contracts are made for all the works together, and consequently the full benefit of the magnitude of the operations is gained in the price. Their intention is that the whole mass shall be built, and the Hotel finished and furnished when the Great Exhibition opens in May.

I propose to direct your attention chiefly to this Hotel, as a work of very great importance, the length being 501 feet, and the depth varying from 184 to 124 feet.

There are several entrances, so that the Hotel may be divided into two parts. No part of the ground floor, or of the entresol, except those occupied by the entrances is to be appropriated to Hotel purposes, but these portions of the plan are to be appropriated to shops, and the accommodation of the shopkeepers; therefore it is *au premier*, that the Hotel begins. [Referring to Plans.] All this part of the first floor is appropriated to Princes and Ambassadors, and other distinguished persons; and you will perceive that it comprises numerous suites of apartments, with separate staircases. Here is one grand staircase of stone, (the flight of steps 9 feet wide) with two other principal staircases to the right and left. *Here* is a place for taking in luggage, and *here* is a carriage entrance to a court about 66 feet square, which is to be covered with glass. The under part of *this portion* [referring] is for carriages in waiting—the stables being in another part; and *here* are other carriage exits into the Rue St. Honoré, and the Rue de Rivoli.

The first floor contains a grand saloon for the generality of visitors, 133 feet long by 21 feet 6 in. wide, two reception rooms, 37 ft. by 24 ft., and 33 ft. by 24 ft.; a coffee-room and dining-hall 125 ft. by 45 ft., twenty-nine large rooms about 30 feet by 20, and ninety-six smaller rooms, making a total of 125 rooms, besides the gallery, and the dining-hall for the table d'hôte; six principal, and eight secondary staircases; and above twenty water-closets; the passages are 7 ft. 6 in. and 8 ft. wide.

There is an arcade with shops under it on the sides next the Rue de Rivoli and the Place du Palais

Royal, but on the other two sides there are no arcades. There is a great deal of merit in the arrangement of the private apartments, especially as to the facility of access and egress.

On the second floor, the general arrangements are similar to those below, and there are 168 rooms of various sizes, from 13 or 14 ft. to 10 ft. wide, and from 11 ft. to 20 ft. long; these rooms are of handsome proportions, and larger than in our own ordinary hotels.

There is another story above this, which is arranged in the same way; and there are two stories in the roof. In the lower of these the walls are upright and the rooms are good, and those above are for servants. There is no division of the servants' apartments into groups, but they all communicate with one common passage.

The total height of the building, from the pavement of the street to the ridge of the roof, is 90 feet. From the level of the street to the top of the cornice, the height is 66 feet, leaving 24 feet for the roof. The heights of the different apartments are as follows;—Entrance floor, 12 ft. 2 in.; entresol, or mezzanine, 9 ft. 2 in.; first floor, 14 ft. 6 in.; second floor, 11 ft. 5 in.; third floor, 9 ft. 6 in.; two stories in the roof, each 8 ft. 6 in.; these dimensions, with about 7 ft. for the thickness of the floors, make the total height of 90 feet.

The roof plays an important part in the design, and I certainly think that a great deal of the majesty of French buildings is derived from these lofty roofs. If the roof were to be taken off the Tuileries it would reduce the building to the humble proportions of an English Palace; and if the Palace of Versailles had such a roof, it would not look, from the gardens and terraces, so mean and poor as it now does. Moreover we must bear in mind that the French do not object as we do to an extra flight or two of stairs.

With reference to the construction of this building, it may be mentioned that the basement is vaulted with arches of brick or stone, and the builder has excavated to a great depth (in some part 25 feet below the surface) to remove the old foundations. Part of it is appropriated to kitchens, and part to stores for goods. The walls in the basement are built of wrought stone at the angles and openings, to give strength and solidity, with moellon, or rubble work, in the intermediate spaces. The outer walls above the basement are all of good free stone, left rough, but to be dressed and carved hereafter. In the floors, the fire-proof construction, which is very popular in Paris, and which the Emperor wishes to be used, is adopted. It consists of I-shaped rolled iron girders from 6 to 8 in. deep, and 2 ft. apart, kept together by saddle-bars. Boards are placed beneath the girders, and the space is filled in with pieces of stone, and the excellent plaster of Paris. This concrete sets in a very few hours, and the boards are removed, the mortar being sufficiently tenacious to hold the mass together. There are long diagonal iron tie bars at the angles of the walls, to keep the whole construction compactly together.

In the upper floors, the staircases are mostly circular. In this country we generally consider such staircases as dangerous to descend, but they are not objected to in France, and they certainly economize space. The roof is of wrought iron, very light, and put together with great skill; and there are outside galleries along the upper cornice, which serve for the exercise and convenience of the occupants.

Mr. Donaldson proceeded to describe some other private houses, part of the new buildings shewn on the general plan, but distinct from the great Hotel. In illustration of these he referred, in detail, to the plans, elevations, and sections; and remarked particularly on the comparatively small number of bed-rooms connected with the principal suites of apartments.

He further called the attention of the meeting to the improvement of the Bois de Boulogne, another work of the Emperor, now almost completed; and to a project for the erection of first-rate houses around the Arc de l'Etoile, in accordance with a design by M. Hittorff. He referred, in conclusion, to the works recently executed at the Luxembourg, and particularly to the Salle de Reception formed out of the old Salle des Conferences and two other apartments belonging to the former Chamber of Peers, which had been thrown into one magnificent Hall, 200 feet long, resplendent with marble, paintings, and gilding, in perfectly refined taste. For all this magnificence the French people were indebted to the Emperor, who was a great friend to architecture, and had judiciously given much profitable employment to the working classes, at the same time that he rendered Paris the first city in the world for the magnificence of its monuments—the ample and commodious lines of its thoroughfares and public streets—the improvement of its salubrity,—and a centre of attraction to the people of every other country,—in fact of European arts and civilization,—thus by the judicious and not parsimonious outlay of a few millions, contributing to the prosperity of the people, and the promotion of their commerce and manufactures.

Mr. Scoles, Hon. Sec., mentioned, as a scale to the size of the Hotel buildings referred to, that the river front of Somerset House was 530 feet long, and the total height of the houses in Carlton Gardens, including the basements in St. James's Park, was 90 feet.

Mr. G. R. Burnell, C. E., stated that, in his opinion, nothing had yet been erected to equal, in magnitude and completeness, some of the great hotels of the United States; in which the arrangements washing, for carrying up goods, and cooking, were carried out by the aid of steam, in a very successful manner. The great length of the galleries in the French Hotel was an objection which would perhaps be felt more by English than by French visitors; and the same remark would apply to the appropriation of the ground floor and mezzanine to shops, obliging visitors to ascend a greater number of stairs. Very good rooms were shewn upon the plans at a height of 80 feet from the ground, requiring 160 steps to arrive at them. The laws which regulated building in France rendered it necessary that the cornice should not be more than 66 feet from the pavement;—above that height it was allowed to build in the roof, but the roof itself must be bounded within a portion of a circle of a certain radius. This law was enacted in the time of Louis XIV, and the Mansard Roof was invented for the purpose of evading its provisions. These roofs did not add to the grandeur of the buildings, but on the contrary, they had a clumsy and heavy effect, especially when seen continuously in the long streets of the Continent; and the rooms in them were necessarily uncomfortable. In the new works referred to, the architects appeared to have departed from a very good arrangement which prevailed in the time of Louis Philippe,—that of cutting off the corners of each block of buildings;—a plan which was only partially adopted in the new works under consideration. It was a very grave question in his mind, how all these expensive improvements were to be paid for.

Mr. Donaldson observed that the works were not sufficiently advanced to admit of any opinion being expressed as to the internal or domestic arrangements of the Hotel; but it should be remembered that the domestic habits of the French rendered these arrangements a more simple matter than in England. The long galleries might easily be divided by partitions. The height of the cornice was in accordance with that of the adjoining buildings previously existing; and although the latter might have been limited by the law, yet that law allowed ample latitude; indeed very few houses in London were 66 ft. in height to the cornice. The rooms in the roof were not objected to in France, and of course the charge for occupation was regulated with reference to their height from the ground. He thought the plan of cutting off the angles of the blocks was desirable only at the corners of narrow streets; as in the case of wide streets, it rendered the crossings more dangerous to pedestrians. With regard to the pecuniary question, that might be safely left to the Emperor, who knew the value and the want of money as well as any man, and had shewn that he also knew how to use it wisely. The municipality of Paris, too, had acted most judiciously in promoting these improvements,—which must tend to make a trip to Paris so irresistible, that all the world must visit it,—and could not fail to add to the commerce and prosperity of the city. A large sum had been expended from the proceeds of the octroi in these improvements, and the result, he felt assured, would fully justify the expenditure.

Mr. H. H. Burnell, Associate, remarked, that many large houses in and near London, originally occupied by the nobility and gentry, were now let as offices; and that, if this appropriation of them should increase, it would be much better at once to adopt the French system of living in separate floors, and to build accordingly.

Mr. Ashton, Fellow, confessed that he was not much struck with any great advance which had been made by the French over the English in the new works in question, so far as Mr. Donaldson had explained and illustrated them. He concurred with Mr. Burnell in thinking the effect of the French roofs, surmounting stone walls with a heavy black mass, was very little short of ugly. The limit of 66 feet for the height of the cornice from the ground was very objectionable, and might prevent any grand architectural effect. He had himself lately built houses in Victoria Street which were 80 feet in height from the pavement to the top of the cornice. The height indeed, was a question of ground-rent; it being necessary to build such houses as would pay the expense of making new streets, and substituting large thoroughfares for narrow and crowded streets; and this argument applied as forcibly to Paris as to London.

Mr. H. H. Burnell said, that he had not observed any buildings in Paris whose arrangements were on so great a scale as those in Victoria Street. There might be some with larger rooms, but generally the French houses were smaller. The new buildings in Victoria Street were the largest ever erected for lodgings, and were exceedingly spacious and convenient.

Mr. C. H. Smith, Visitor, suggested that there did not appear to be any party-walls, or other arrangements, to prevent the extension of fire throughout the large Hotel.

Mr. Scoles observed, that both the walls and floors might be considered fire-proof, and that party-walls were consequently rendered less essential for safety.

Mr. G. R. Burnell remarked, that, generally speaking, the front walls of the Parisian houses were of dressed ashlar, and the back walls of quartering filled in with moellon.

Mr. Donaldson stated, that no wood was employed in the walls of the buildings he had described.

Mr. H. H. Burnell said, that the high roofs in question had, at all events, the advantage of being set back, so as to allow of the admission of air and light into the street.

Mr. Harding, Visitor, inquired how the different floors of these large buildings were supplied with water.

Mr. G. R. Burnell stated, that there was no water supply to any house in Paris above the first floor; that for the upper floors was afforded by the water carriers.

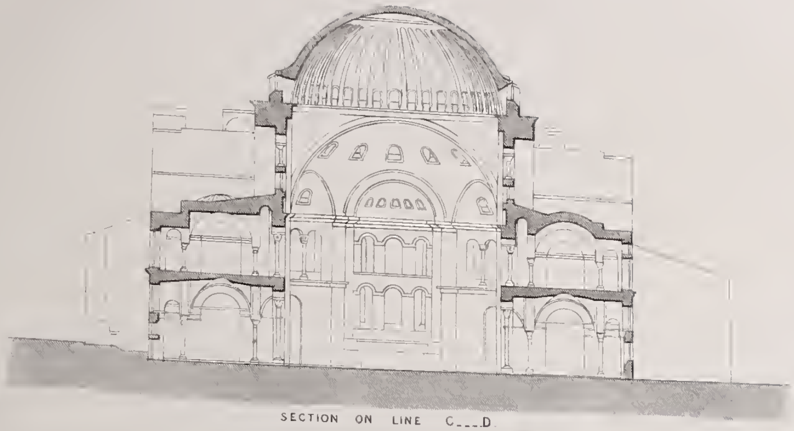
The Chairman, Mr. Penrose, V.P. proposed the thanks of the Institute to Mr. Donaldson for his interesting remarks, as well as to M. Hittorff, and the other architects associated with him, for their valuable donation of the contract drawings of the buildings in question.

The vote having been carried, the meeting adjourned.

At the subsequent Ordinary General Meeting, February 5th, 1855,

The Chairman, Mr. T. H. Wyatt, V. P., said, before passing to the regular business of the evening, he wished to refer to the subject of the previous meeting. In addition to the immense construction in the Rue de Rivoli described by Mr. Donaldson, our energetic neighbours and allies were building three other very large Hotels—one in the Boulevard des Capucines, on the site of the "Hôtel D'Osmond;" another, "L'Hôtel du Palais de l'Industrie," in the Champs Elysées, to contain 422 private rooms; and a third, "L'Hôtel de L'Exposition," belonging to "La Societé des Cafés, Hôtels et Restaurants de Paris."

Reference had been made to the insufficiecny of the Water supply of Paris. In the newspapers of the following day he had seen an extract from the "Journal des Débats" giving an account of a grand "projet" which was under the consideration of the Municipal Commission of Paris. It consisted in substituting for the waters of the Seine Spring Water, brought in large quantities by a gigantic Aqueduct from the Valleys of the *Marne*, between Chalons and Epernay. It was calculated to give a supply of 1,000 quarts a second, or 21,600,000 gallons per day of twenty-four hours, delivered in Paris at a height of about 250 feet. This would ensure a most abundant supply to four-fifths of Paris—the remaining portion would be provided by means of Steam Engines pumping from the present sources, viz., the Seine, the Canal de l'Ourcq, the Aqueduct of Arcueil, the Well at Grenelle, and the Waters of Belleville and the Pré St. Gervais. He believed this was very like the scheme of Napoleon I, which, he had always understood, was abandoned on account of the bad quality of the water; but it was stated that a Mons. Legrand had discovered a stream called "*la Somme Soude*," the water of which was very fresh, of extraordinary purity, and extremely agreeable to drink. He believed it was not so much a question of insufficiency of water as of the inconvenience of not having it supplied to the houses by gravitation or by artificial means, as in London. Political reasons had, no doubt, hitherto operated in this matter as in others of a sanitary nature. The "Porteurs d'Eau" of Paris were too numerous and formidable a body to be thrown out of employment. It was, however, a fine subject for the energy and powers of the present Emperor, whose comprehensive mind, he had little doubt, would find a solution of this as of many other social questions.



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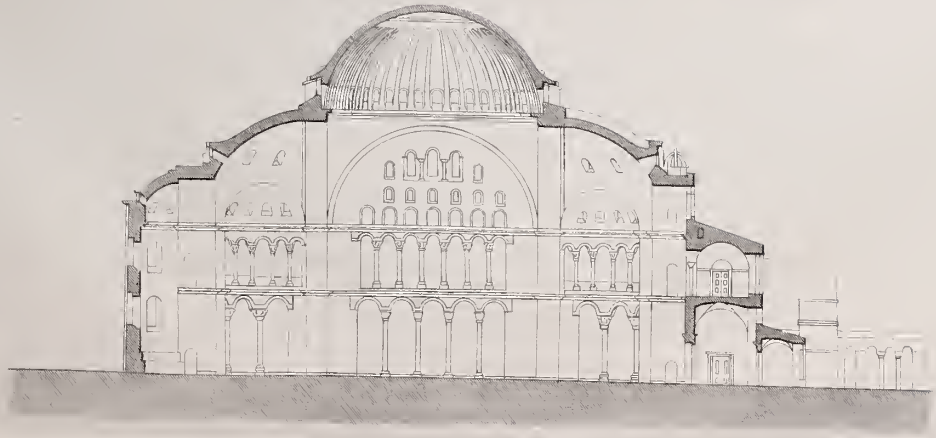

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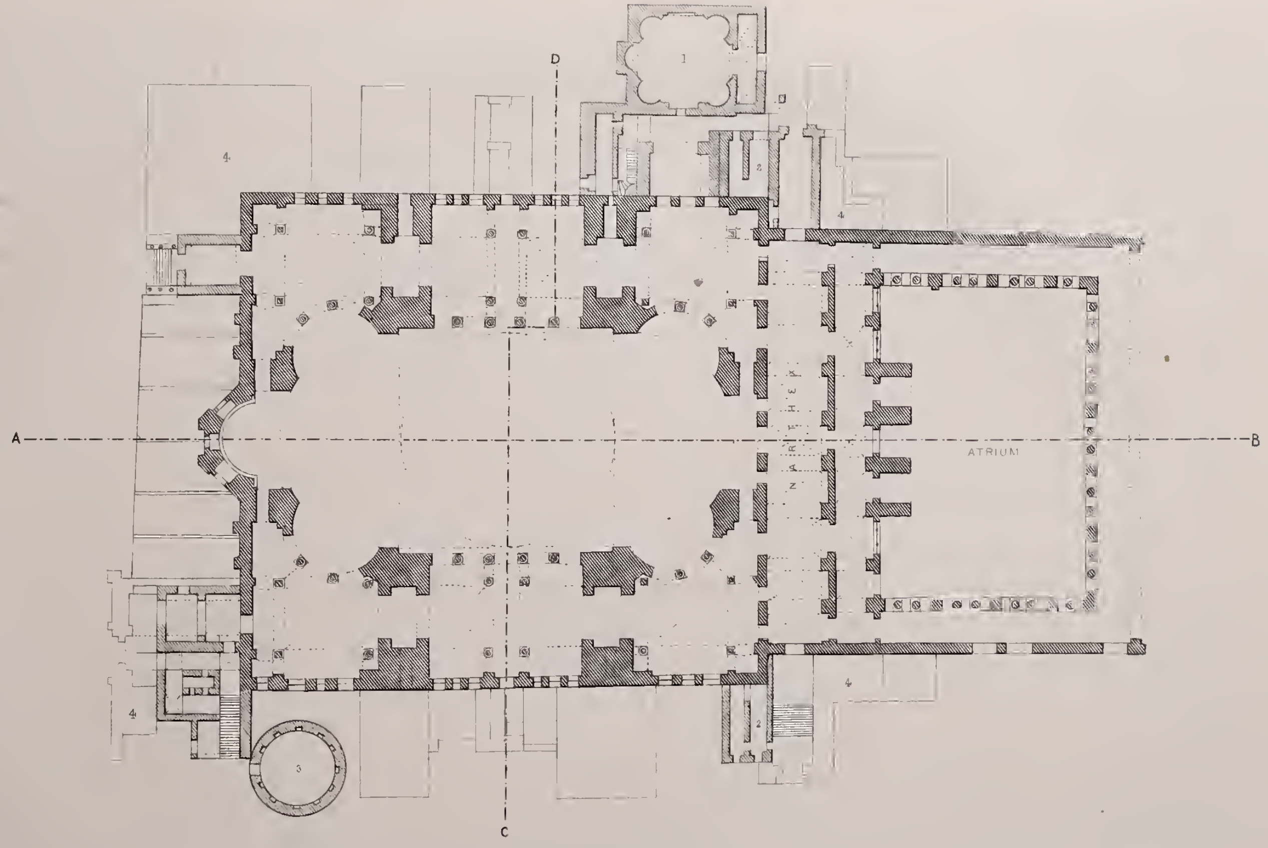

[illegible] lighter hatching [illegible]
the tower buildings [illegible]
Turkish [illegible] are
shown in outline only

1 Baptistery
2 2 Ascent to Galleries
3 Sceuophylacium
4 4 4 4 Minarets

GROUND PLAN OF STA SOPHIA CONSTANTINOPLE
reduced from Salzenberg's Work

Scale of 0 10 20 30 40 50 60 70 80 90 100 150 200 300 Feet

[illegible] Lith. King St. Covent Garden

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SOME NOTICE OF AN ILLUSTRATED WORK BY W. SALZENBERG, ENTITLED EARLY CHRISTIAN MONUMENTS OF CONSTANTINOPLE, FROM THE FIFTH TO THE TWELFTH CENTURY.

By Charles C. Nelson, Hon. Sec.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, February 5, 1855.

Much attention has been given, says Salzenberg, during the last fifty years in England, France and Germany to investigating and delineating the remains of Christian art subsequent to the Tenth century—but not previous to that date. The present day has, however, recognized the importance of the earlier style, the Byzantine, in introducing a new era and freeing the Architecture of that time from the restraints imposed by a mere imitation of the antique.

The earliest remains of Christian buildings in Constantinople, if any of them exist, date from the first half of the Fourth century, when according to Du Cange not less than four hundred and thirty religious edifices, churches, chapels and monasteries were raised in the city and its suburbs under the auspices of Constantine; but the difficulty of access to the Mosques into which the Christian churches had been converted presented insurmountable obstacles to any satisfactory investigation—especially of Sta. Sophia—till the repairs in the years 1847-1848 afforded a favourable opportunity, and the King of Prussia despatched Salzenberg to the spot. Aided by Fossati the Architect employed, he was enabled to prosecute his researches, and take full and accurate measurement of that building and its details, as well as to collect other materials for the work before us, which forms a valuable supplement to the collection of views published by Fossati from drawings made on the same occasion.*

The text affords much information on the subject of Byzantine architecture and its development in connection with antique types of Art, and the arrangements peculiar to the Christian form of worship. It also contains a full explanation of the plates, in which the Turkish additions to the ancient buildings have been omitted, or indicated only by faint lines, and the original forms have been restored, as far as possible, in conformity with the existing remains.

The largest portion of the work is devoted to Sta. Sophia, but the following buildings are also illustrated and described. The Churches are arranged in chronological order—Agios Johannes, built A.D. 463, is the only example of the Roman Basilican type remaining in the East; it has two tiers of columns on each side of the nave, a vaulted apse, and a wooden roof; the columns are of the Roman Composite order. Agios Sergios, one of the first built by Justinian in the beginning of the Sixth century, is an example of the transitional style. (Agia Sophia built 532-538, which has a cupola, and is vaulted throughout, shows the perfect development of the Byzantine style, and will be described hereafter). Agia Irene, apparently of the Eighth century, follows the type of Agia Sophia, and has a cupola. Agia Theotokos, of the end of the Ninth century, has a cupola. Agios Pantokrator, built in the first half of the Twelfth century, has a cupola and a double narthex or vestibule. The Hall on the Hebdomon, near the quarter of the city called Blachernæ (commonly designated the Palace of Constantine), is built of stone and brick, and dates apparently from the Ninth century. The cistern of Philoxenos or the Bin-bir-direk (the thousand and one columns) has columns with capitals of the cubic form, which is generally supposed to have been invented in Western Europe at a later period of the middle ages. One of the Suterasi, or water-pillars, is apparently of Byzantine and not, as such erections usually are, of Turkish origin.

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* Aya Sofia, as lately restored by order of H. M. The Sultan Abdul-Medjid. Folio. London, 1852.

Some examples of more ancient capitals of columns are given to show the influence that such remains in Greece and Asia Minor had on early Christian art in Constantinople; and drawings of three churches are introduced from Texier's work on Asia Minor to prove that after the Sixth century Sta. Sophia was generally adopted as a model in other parts of the Byzantine empire.

Though the buildings of Diocletian and Maxentius exhibit much skill in the construction of large vaultings, they show the extent to which art had declined at Rome and in the provinces. The hasty and probably slight construction, the numerous earthquakes and human violence, have prevented any of those subsequently erected by Constantine in his new capital from enduring as examples to the present time. But the remains of Justinian's buildings bear evidences of the influence of late Roman art during the first period of the Byzantine school. In them the Roman Corinthian and Composite orders are imitated, though with many deviations. The leafage is treated in an Hellenic rather than in a Roman manner—the tradition of older works previously introduced from Greece and Asia Minor. This peculiar acanthus-like treatment of the leaf ornament continues in works of the Byzantine school to the latest period, and something very similar may be observed in mediæval buildings of the West of Europe. Though the columns present an imitation of the Attic base, deep and heavy members are introduced at either end of the shaft in place of the classic apophyge. Alterations in the proportions of the entablature and its divisions, the omission of the corona in the cornice, the overcharging the entablature with egg and bead enrichment and flutings—arches springing at once from columns, or the architrave curved to form an archivolt to the arches between them—these and many other licenses to be seen in the buildings of the late Roman school may be observed in those of the early Byzantine.

The first church dedicated to Sta. Sophia by Constantine or his son Constantius, (326-360), which appears to have been a Basilica after the Roman type, with a wooden roof, was destroyed by fire during a revolt A.D. 532. Justinian entrusted the erection of the new edifice to Anthemius of Tralles. It was commenced within forty days after the fire, and having been completed in less than six years was dedicated on the 26th December, 537. Security from fire was a condition strictly enjoined on the Architect, which the vaulted construction has fully ensured to the present day, notwithstanding the numerous conflagrations that have occurred in the city.

Several remarkable deviations from the arrangement of plan observed in the earlier churches result from the particular kind of vaulted covering adopted, which consists of a cupola vault, supported over a quadrangular space by four equal semicircular arches or barrel vaults, corresponding with the sides of the square. The transition from the square to the circular form at the foot of the cupola is effected by means of gussets or pendentives, filling up the angles between the semicircular arches. The interior thus derives an imposing effect from the boldness of the vaulting, though the show of colour and of precious materials has been preferred by the Oriental Christians to correctness of form and execution in the sculptured enrichment. Columns of rare marble taken from ancient buildings, walls lined with many coloured marbles, and vaults covered with golden Mosaic—produce an interior to rival the painted walls and gilded ceilings of later basilicas. The walls and vaults are of brick; the external elevations are plain and exhibit the naked constructive forms, which divide the larger masses into portions, again subdivided and terminated by simple horizontal members. The external covering of the roof rests immediately on the vaulting. The Cupola, terminating in a contrasted curve at the base, gives the principal external character to the building. Piers, with arched window openings between them, form an external tambour for the cupola. All the windows have semicircular arched heads. Barrel and cupola vaultings prevail throughout, and the groined vaults terminate in small cupolas or domelets; later buildings, however, have ordinary groined vaults. The exterior walls of the apse in all the examples at Constantinople present three or more faces, and never a simple circular outline.

Twenty-two years after the dedication, a violent earthquake having destroyed the eastern part of the cupola, Justinian caused it to be raised twenty-five feet; the counterforts were strengthened and the interior was renovated. Since that time, notwithstanding the numerous earthquakes* which have taken place at Constantinople in the course of thirteen centuries, the bold system of construction employed at Sta. Sophia has lasted well, and but few extensive repairs are on record. The first took place in the second part of the Ninth century, when the western arch under the cupola was restored and decorated with the figures of the Virgin, St. Peter and St. Paul in mosaic work. Another large arch was repaired probably in the first half of the Tenth century. Somewhat later, part of the cupola, injured by an earthquake, was repaired from a suspended scaffold. During the usurpation of the Latins in the Thirteenth century it is probable that little was done to preserve the building. On the return of the Greek emperors in the Fourteenth century, the eastern angles were strengthened by works called by one author Pyramids; the repairs to the bema and the great portico injured by an earthquake were commenced towards the middle of the same century, and on their completion the restoration of the mosaic work was carried out.

After the fall of Constantinople, A. D. 1453, Mahomed II. destroyed the arrangements adapted to Christian worship, and dedicated Sta. Sophia to the service of Islamism. The effects of this change are however less visible in the interior than on the exterior of the building; the form of Mahomedan worship being simple, and consisting chiefly in the repetition of daily prayer. The mihrab, a niche indicating the direction of Mecca and containing the Koran; the minber, a raised stand from which the prayer for the Sultan is repeated on Fridays; the mahfil, a platform of moderate height from which the Koran is read; lamps for illumination during the fête of the Beiram, and a carpet spread over the pavement, constitute the requirements of a Dschami, or place of meeting of the faithful, to which at Sta. Sophia the Makssure, an enclosed elevated seat for the Sultan, has been added on the north of the space formerly appropriated to the clergy. The parts appropriated to the Christian laity, the narthex, the nave, and side halls, with the womens' galleries over them, remain nearly unchanged; it is in the destruction of the gorgeous fittings of the bema, of the solea, the ambo, and other parts specially reserved for the clergy, in covering the golden mosaic vaultings with whitewash, and introducing in places huge inscriptions from the Koran, that the principal alterations have been made in the interior. Externally the addition of minarets at the angles, alterations in the adjoining spaces, and particularly the buttresses raised by the over care and want of skill of Turkish architects, have so changed the appearance of the building, that its original form can scarcely be ascertained amidst the mass of confusion.

Mahomed the Second built the first minaret at the south east angle, after he had carried up heavy buttresses in the same place. Selim the Second added the second minaret at the north east angle, 1566—1574, and restored the eastern half cupola which had been injured by an earthquake.

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* Byzantine Authors mention twenty-three violent earthquakes from the beginning of the Sixth to the middle of the Fourteenth century, seven of which occurred during the reign of Justinian, and that of the year 1033 is said to have lasted one hundred and forty days. In the Turkish Imperial History from 1511 to 1765 ten are recorded.

Numerous authors, ancient and modern, have occupied themselves with the history and description of Sta. Sophia. Among the early Byzantine writers, Procopius, Paulus Silentiarius, and Agathias, cotemporaries of Justinian, are alone deserving of confidence—the late Greek Authors abound in fabulous narratives.

Gyllius and Grelot visited the church in the 17th century—and Du Cange affords much valuable information in the Third Book of his Description of Constantinople.

His successor Amurath the Third built the two minarets at the western angles. The building had been much neglected of late years, till the present Sultan entrusted the work of restoration to Fossati, who not only carried out substantial repairs and removed many of the useless buttresses, but also effected a partial restoration of the ancient splendour of the interior; the marble work was cleaned and repolished, the golden mosaic vaulting freed from coats of whitewash, deficiencies supplied with gold leaf and ornament in oil colour, and only the personal representations on them forbidden by the Koran were again concealed to preserve them for future generations. The external face of the walls after the repair was stuccoed and painted with alternate bright yellow and reddish bands, to represent layers of stone in the style of late Byzantine and Arabian architecture.

Sta. Sophia is situated near the Palace of the Seraglio, at the eastern extremity of the present town, where the original Byzantium stood. The Apse of the Church does not exactly face the east, but, as in most churches in Constantinople, it is turned somewhat towards the south-east, the direction of Jerusalem. Of the Atrium, or fore-court on the west, only the open space remains unaltered. It was enclosed externally by walls, and surrounded on three sides by open porticos with marble columns and brick piers alternately, which supported a vaulted roof. Low buildings, the residences of the Imaums, have been built between the remaining portions of these porticos. A marble basin, of Turkish origin, occupies the site of the purifying spring in the centre. Two doors from the open space and one from each colonnade lead into the outer vestibule, which appears nearly in its original state. It has windows in the outer wall, and is covered with groined vaulting. The walls and vaulting are destitute of ornament. The four high projecting piers of squared stone next the court are supposed to have supported equestrian statues. Five doors lead from the outer into the inner vestibule, the narthex, which extends the whole breadth of the church, and is lighted by windows over the roof of the outer vestibule. The walls are lined with panelling of coloured marbles, and the vaulting is enriched with mosaic work. There is an external door at each end, and nine doors on the east side open into the church; the central one, which is the largest, was designated the Royal door. The external main walls of the church enclose a space which is nearly square—the length inside, exclusive of the eastern apse, being 241 and the breadth 224 feet.* In the middle, four strong semicircular arches, supported on piers at the angles of a square space, carry the cupola. To the eastern and western of these arches large semicircular niches are attached, each of which is connected with three other niches of smaller dimensions. The two large niches are covered with half cupolas, which abut against the main arches already described. Four of the smaller niches are semicircular in plan, and covered with half cupolas which intersect the large half cupolas, but the central niches or recesses are covered with barrel vaulting—and to the eastern one is attached another simicircular recess covered with a half copula, which projects from the general mass externally and forms the usual eastern apse. Between the four main arches in the centre pendentive vaults are introduced, which meet in a circle 100 ft. in diameter. This circle forms a gallery at the springing of the great cupola, which there measures 104 ft. across between the ribs, and rises at the crown to the height internally of 179 ft. from the pavement. On the north and south of the central nave and separated from it by columns supporting arches, are side halls, each in three compartments. They are repeated on an upper floor to form the gynæceum or womens' choir (accessible by stairs at each end), which is continued as a gallery over the narthex or inner vestibule. The covering of all these spaces is vaulted throughout on both floors, the vaulting being carried by wall piers and the main walls, and by forty columns and eight detached pilasters in the lower, and by sixty columns in the upper story. Numerous windows in the outer walls; forty at the base of the central cupola and others in the semicupolas admit a flood of light to illuminate the marble linings of the walls, and the mosaic work of the vaultings.

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* All the dimensions are given in Prussian feet, one hundred of which are equal to 103 English, or one foot is equal to 1.03 English.

The materials used in the construction of the building are brick and a kind of peperino free-stone, the latter where great pressure occurs, as in the four main piers of the cupola and the adjoining piers, and in those carrying the arched ribs in the side halls. A course of stone two feet high is laid about four feet above the pavement all round the building. The original external walls and vaultings are of brick; the later additions show alternate layers of brick and quarry stone. The Turkish counterforts are of wrought stone. The bricks measure generally 14 in. by 2 in. Some in the vaultings are 14 in. square, by 2 in. thick. In the lower part of the great cupola some are 27 in. long, 9 in. wide, and 2 in. thick, and others are 27 in. square on the side. The light bricks from Rhodes mentioned by early authors are not to be found, those used are made of ordinary earth, well burnt; but to fill in the pendentives under the cupola, a whitish stalactical material, shewing the impression of plants, was used in its rough state. The mortar is of a reddish colour, apparently from the addition of pounded tile, and is laid in thicknesses of one to two inches. The ornamental cornices, entablatures, capitals, and bases (all of Byzantine style), some of the shafts, the parapets to the galleries, with the window frames and bars are made of marble from the island of Proconnesus (now Marmora); which is of a whitish colour shaded with light greyish blue, similar to the so called architectural marble of Carrara. Many of the shafts as well as the slabs lining the walls are of various rare marbles and porphyries. The monolithic shafts were taken from ancient buildings; on the ground floor they are of verd antique ($25\frac{1}{2}$ ft. high, 3 ft. 7 in. diameter), except the eight in the side niches, which belonged to Aurelian's temple to the Sun, and are of deep red Thebaic porphyry. Many discrepancies in height and size are observable. Molded bands of bronze 9 in. to 11 in. high, are fixed at each end of the shafts, either for security or to conceal injuries. These bands were gilt as well as the leafage of the capitals. The pavement is now of whitish marble striped with dark grey; remains of the original marble mosaic pavement are visible only in two places, viz.:—in the south eastern angle of the quadrangular space under the cupola, and in the western gynæceum. The larger slabs of the marble linings are from one to two inches thick, and are secured to the walls with iron cramps and lime mortar. The marble mosaics in the friezes and tablets are formed of pieces $\frac{1}{4}$ to $\frac{3}{16}$ in. thick, joined together on a layer of liquid dark brown resin mixed with fragments of marble and tile. The slabs so formed are about one inch thick, and when hardened were attached to the walls with the same liquified resin.

The main enclosing walls are about 70 ft. high, and are 3 ft. 6 in. thick on the north and south, 4 ft. 6 in. on the east, and 5 ft. on the west, between the nave and the narthex. Piers projecting two feet are introduced internally where the arch ribs rest against the walls. The barrel vaulting of the interior passes through the walls and appears as an arch on the outer surface. All the door and window openings are covered with semicircular arches, and the marble dressings and perforated fillings in were inserted after the completion of the work.

The principal cupola appears at first sight to rest upon four arches, each 100 ft. wide, but in fact only those on the east and west have that span, and on the north and south the real supporting arches are diminished in width to 72 ft. and only $\frac{3}{4}$ of the circumference of these last arches has radiating joints, the parts next the springing being laid horizontally. The buttresses attached to the main piers on the north and south were at first only carried up to the spring of the great arches, and were concealed beneath the roofs over the side galleries, but after the fall of the dome they were raised by command of Justinian, so that they now are within 18 ft. of the basis of the cupola, and form vast projecting masses, necessary perhaps for the stability, but certainly injurious to the external appearance of the building.

The basis of the cupola consists of forty piers resting on the internal circular cornice; they are 3 ft. 5 wide inside, 8½ ft. long in the direction of the radius, and tapering on the outer face have a medium height of 15 ft.; they are connected together by arches, which form windows 4 ft. 9 wide. They project externally and now support metal plates, curved to correspond with the window heads, but they probably once carried brick arches and served as an effective tambour to the cupola; above them still remain indications of further enrichment. The piers are continued as ribs on the inside of the vault (which begins with a thickness of 29 in. over the windows); they project at first 6 in., gradually decrease, and die away into the great central disk of the cupola, which is 37½ in. diameter. At the crown the cupola is only 24 in. thick measured through the holes left for suspending lamps.* The lowest inner faces of the piers are 104 ft. apart, measured diametrically across. The highest point of the cupola rises 46¾ ft. above the gallery at the base; the vaulting of the cupola is therefore less than a semicircle in section. The first cupola must have been much flatter, as according to Agathias the second was made narrower and higher; Theophanes states the increase in height to be 20 ft., Zonaras 25 ft. The cupola was surmounted by a cross. It is evident on close inspection that many hard blows have fallen on it in the lapse of thirteen centuries, its regular shape being destroyed by many swellings and depressions, which, however, are not seen from the ground, while they prove the durability of a cupola vault so long as its supports remain firm. The side halls are vaulted on the same system as the large cupola; four barrel arches enclosing a rectangular space carry a flat cupola. The lower side halls exhibit a mixture of cross and domical vaulting, the groins terminating in very flat cupolas. In the upper galleries or women's choir the cupolas are higher, and they answer in section to a sphere whose diameter equals the diagonal of the rectangular space over which it is placed. The vaulting of the narthex resembles that of the side halls, the outer narthex has ordinary cross vaulting.

All the arches on columns round the nave, both below and in the women's choir, have iron tyes; in the three greater arches belonging to the gallery at the west end of the nave there are wooden straining beams under these iron tyes. In the lower row of windows of the north and south walls of the central nave an iron tye was also visible, which appeared to extend through the whole span of the main arch. All the vaults which serve as roofs are covered with sheets of lead ¼ in. thick, fastened to wood laths resting directly on the vaults without any wooden roofing. As they must consequently be repaired from the outside, several stairs and gangways giving access to all parts are provided; and only the main cupola requires ladders to be raised from its base for that purpose.

The cupola of St. Peter's at Rome is not seen with effect till the spectator is beneath it, and its supports equal half the space left free; from the central entrance door of Sta. Sophia, the eye embraces at a glance the greater part of the interior with the aerial cupola, the supports of which amount to barely one-tenth of the unencumbered space.

Of the three kinds of interior decoration employed, sculpture, marble linings, and glass mosaic painting, (oil painting was not used, unless gilding the ornaments in relief be considered such) the first holds only a subordinate place, and is obviously not a main element of Byzantine art; but the marble decoration is in unison with the Oriental taste for show and glittering colours, which was gratified by the display of rare and precious materials, taken from ancient temples throughout the empire. All the walls of the interior of the church and narthex are lined, from the pavement to the vaulting, with slabs and bands of variously coloured marbles. In the church the mass is divided horizontally by two cornices of white marble, simple in profile and enriched with leaf ornaments, and a cornice is carried round the foot of the cupola. All the bands, as well as the panels, are surrounded by narrow borders of white marble, charged with fret work. The larger panels have wider borders of the same material, carved with ribbons and rosettes between frets and beads; by this means a marked division of the various marbles is obtained. Single friezes and panels are further ornamented by mosaic work, like the Florentine, representing leafage and tendrils, flowers, fruits and animals. The arches and spandrils over the columns between the great piers in the nave are covered with relief ornament in white marble; on the upper floor these parts contain mosaic work of coloured marble. The ornament, which has a peculiar stencilled character, was once gilt, and the remains of deep red colour are seen in the sinkings. The walls of the bema are of the richest description, being almost entirely covered with slabs of marble mosaic; they formed with the barrel vault over them the arcus triumphalis, under which stood the gorgeous ciborium and the holy table. The walls of the adjoining apse, which contained the patriarchal chair and the seats of the priests, are less ornamented.

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* The western barrel vault of the nave is 4 feet, and the eastern half cupola 3 feet in thickness.

In obedience to the command that combustible materials should be avoided, the window openings are filled with bars of marble or stone, and the leaves of the doors were of bronze or of wood covered with it. The larger window openings are subdivided by piers or columns, with narrow architraves or transoms fixed midway in the height. Perforated slabs, 4 in. thick, form the window bars, which are about $3\frac{1}{2}$ in. wide, and are splayed inwardly. The panes of glass* (originally cast singly) vary in height from 9 to 10 in. by 7 to 8 in. in width. The door dressings are of marble, with the exception of those belonging to the royal door which are of bronze. Of the bronze door leaves, those at the south end of the narthex are alone deserving of special notice. They are apparently formed of Hellenic work of the best kind taken from some ancient temple, with Byzantine additions to adapt them to the opening. The plates of bronze, $\frac{1}{8}$ to $\frac{1}{4}$ in. thick in the old part, $\frac{3}{8}$ to $\frac{1}{2}$ in. in the later, are fixed on leaves of wood 4 to 5 in. in thickness.

According to Paulus Silentiarius, the ambo was placed centrally between the main eastern piers, but advanced somewhat westward, and beneath it the singers stood behind a barrier. Behind the ambo, the solea, appropriated to the inferior clergy, occupied the whole of the space under the eastern half cupola, which was separated from the rest of the nave by a low divisional wall. The smaller semicircular recesses, adjoining on the north and south, termed the prothesis and the diaconum, were used for purposes connected with Divine worship. Between the smaller eastern piers under the half cupola, a screen about 14 feet in height, ornamented with twelve columns and having three doorways, divided the solea from the bema, which occupied the whole of the central eastern recess. The altar, covered by the ciborium or baldachino, was elevated under the arcus triumphalis of the bema; and the patriarchal chair and the seats for the superior clergy were placed in the curve of the semicircular apse. The rest of the ground floor was given up to the laity. The place of the emperor was enclosed at the east end of the south side hall, that of the empress was in the middle division of the women's choir, probably on the south side, which was connected with the Palace. Fifty priests, one hundred male and forty female deacons, ninety sub-deacons, one hundred lectors, twenty-five cantors, and one hundred ostiarii, were attached to the establishment in the time of Justinian. Heraclius fixed the number at eighty priests, one hundred and fifty male and forty female deacons, seventy sub-deacons, one hundred and sixty lectors, twenty-five cantors, and seventy-five ostiarii; but the clergy served also three other churches in the neighbourhood.

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* It is doubtful whether the glass panes in the windows belonged originally to the building.

A cupola church arranged in conformity with the example of Justinian's building, which served as type till late in the middle ages, presents a square figure containing the arms of a cross covered with barrel vaults, their intersection crowned by a high cupola raised on a drum or tambour. The four spaces between the angles of the square and the cross are covered with small cupolas or domelets, and are lower than the arms of the cross. These parts together constitute the nave. The eastern arm is usually extended to form the bema for the clergy and is terminated by the principal apse. The two spaces at the eastern angles are lengthened in a corresponding manner and terminated by the side apses. At the west end the vestibule, the single or double narthex, occupies the whole width of the Church. The plan of the whole church is therefore oblong, from which three apses project at the eastern end, and in which the nave is marked as a cross. In smaller churches the extension eastwards is omitted, and the three apses are directly connected with the square of the plan, which is lengthened only towards the west by the vestibule or narthex. In large churches the women's choir or galleries occupy the north and south arms of the cross and the spaces at the angles, which are thrown together by arched openings in the walls between them. In this case there is a connecting gallery over the narthex. In small churches the galleries or women's choir are omitted, and the barrel vaultings are supported on arched ribs, springing from piers attached to the enclosing walls, and from four columns or detached piers under the cupola. This disposition, which leaves the quadrilateral space of the nave unencumbered, the cupola as well as the barrel vaults at the intersection of the cross resting only on the four supports, belongs to the later time of the Byzantine school. To the above arrangements were attached at the western end the atrium or fore court with its porticos and entrance.

Mr. NELSON, after alluding to the discrepancies existing in different accounts as to the dimensions and other particulars of the dome or cupola of Sta. Sophia, expressed a hope that another evening might be devoted to domes, as much more might be said upon the subject generally; and he hoped, in reference to Sta. Sophia, they might have the benefit of Mr. Petit's researches on the question of Byzantine architecture, and its applicability in the present time. Mr. Garbett's work might also be consulted on the subject, as the author traced the change from the Roman style of cross-vaulting to that used at Sta. Sophia, and compared the cross or groined with the domical, and pointed out the merits and defects of each in a very clear manner. It would be interesting to consider the different modes of lighting domes; the ancient western example, the Pantheon, was lighted from the centre; the eastern ones from the sides; and the modern domes of Europe from the centre. He then referred to a diagram shewing how domes had been progressively heightened, from the proportions found in the Pantheon to those of the most recent building.

Mr. DONALDSON, Hon. Sec. For. Cor. having made some remarks as to the women's galleries,

Mr. PAPWORTH, Fellow, went into the question at some length, referring to the plan of Sta. Sophia in explanation. He then enquired whether the bema was occupied by the bishop, or the presiding presbyter and his assistants, when there was a screen shutting out the view of the sanctum from the body of the church.

Mr. HENEKER, Associate, referred to the church of S. Ambrogio at Milan, and the cathedral at Torcello, where the apse still showed precisely the same arrangement as in the most ancient times.

Mr. DONALDSON observed that there was a distinction between the Greek and the Roman Catholic forms.

Mr. **Heneker** replied, that the Greek forms were introduced into the earliest Italian churches, and, at the time of the erection of the two edifices referred to by him, the Roman had indeed scarcely separated from the Greek church. Almost all the types of the Greek church, and the forms of Greek monuments, might have been carried to Torcello, and indeed the same forms were generally introduced in the most ancient churches of Northern Italy as in Constantinople.

After some further remarks by Mr. **Donaldson** respecting the internal arrangements of the Greek and Latin churches,

Mr. **Nelson** suggested that if that question were to be discussed, it would be very desirable that the Institute should, at the next meeting, have the benefit of the attendance of the Rev. Mr. Burgess, whose knowledge of the subject was shown in a paper on the Ancient Basilica, read at the Institute a year or two ago. It appeared, however, to him, that the main question for consideration was the construction and decoration of the church of S. Sophia, and other analogous edifices.

The Chairman, Mr. T. H. **Wyatt**, V.P. proposed the thanks of the meeting to Mr. Nelson for the great pains he had taken in making known to the members the contents of Salzenberg's valuable work, which would otherwise have been to himself, and probably to many others, a sealed book. He then stated, that in compliance with the general wish the subject would be resumed at the next meeting, when Mr. Digby Wyatt would offer some observations on the mosaic and other decorations of the Church of Sta. Sophia.

REMARKS ON THE MOSAICS AND OTHER DECORATIONS OF THE CHURCH OF STA. SOPHIA, CONSTANTINOPLE.

By M. Digby Wyatt, Fellow.

Addressed to the Ordinary General Meeting of the Royal Institute of British Architects, Feb. 19, 1855.

Mr. Wyatt spoke as follows:—Gentlemen, the subject for consideration this evening is based upon the ground which was opened by Mr. Nelson at your last meeting. On that occasion he not only trenched the ground, but he reared the foundations and re-built the edifice of Sta. Sophia, giving you a good idea of the distribution and the main structural features of the building. Mr. Nelson was pleased to leave to me the task of conveying to your minds some idea of the magnificent clothing and completion of the carcase; and that forms the subject upon which I propose to address you this evening.

The decoration of Sta. Sophia is of two principal kinds; one consists of a certain number of points, more or less structural, to which I shall first call your attention; and the other of a system of mosaic ornamentation of the highest importance in relation to the history of that art—so important, indeed, that I propose to bring under your notice first, the mosaics of Sta. Sophia as they exist; secondly, their historical position as compared with other mosaics; and thirdly, their peculiar technicalities of production; so that our review may embrace, not only the artistical nature of these magnificent monuments of early Christian art, but their historical position, and the actual mechanical operations by which they were executed.

The principal technical point in relation to the general working of the sculptured ornament of Sta. Sophia to which I would call your attention is displayed, almost universally, in the capitals and other carved features which stamp Byzantine architecture with its leading peculiarities of style. In classical architecture, the principle of superadding foliage to construction was generally followed, and in obedience to this law both ancient Greeks and Romans usually adopted a bell or a moulding line as a basis, and then planted on such a fundamental form whatever decoration of leafage they desired to use. The Byzantine architects departed from that system by first cutting their stone-work into the general shape required, and then sinking or draughting into it all their different enrichments; and from this it follows as a corollary, that Classic ornament was completed before the erection of the block of stone or marble decorated, and that Byzantine was executed subsequently to the fitting in place of the main structural forms. This is the general principle which distinguishes Byzantine from Latin work; and wherever we recognise its adoption in the architecture of India, Russia, Lombardy, or the North, we may be sure that the influence of the Byzantine school was paramount; as was especially the case at Pisa and in Sicily. As Byzantine architecture reached its earliest, as well as its highest, development in Sta. Sophia, it becomes exceedingly interesting to recognise the unquestionable assertion of this principle by its architects and artificers.

The second point with regard to ornamental decoration to which I shall allude is very important, since it materially affects the history of both plain and coloured glass. The windows of Sta. Sophia are formed of a series of slabs of marble, pierced in apertures of about 8 inches by 10. In these sash-bars, as I may call them, there is a rebate left on the outside in all cases, and it appears to me most probable that these apertures were filled in with coloured glass. The reason I have for thinking so is, that we know that the Byzantines were perfectly well acquainted with all the processes of glass-making. Their enamels were proverbially beautiful, and Buonarotti has given us many interesting details concerning their glass vessels, which they painted with fluxes, and decorated by other processes at a very early period. Of many varieties of such vessels there are specimens existing in the Museum Christianum of the Vatican at Rome. These actual remains prove to us that they were masters of the technicalities of glass-work. Paulus Silentiarius alludes to the beautiful effect of light and colour in this building of Sta. Sophia, when seen in the early morning; and Paul the Hermit, and Fortunatus of Poictiers, in his " Carmina," also describe this effect. Theophilus, who was a writer on the technical arts a little before our Conquest, has a whole treatise upon the subject of stained glass, which he prefaces by stating that he had taken the pains to go to Sta. Sophia to examine the effect of the light, coloured by transmission, in order to qualify himself for writing this section of his book. When it is remembered that Sta. Sophia was commenced in the year 532, and completed about 540, it is interesting to have grounds for the belief that stained glass was extensively used at such an early period.

Until recently the assertion of the Benedictines, that coloured glass was not known previously to the time of Charlemagne, has been generally regarded as correct. French and English antiquaries have, however, found allusions to its existence at a much earlier period, as early indeed as the year 600, and the details now given to the world concerning Sta. Sophia afford a strong corroboration of their views.

These windows, in their general form, present a certain number of square compartments, by filling in some of which and omitting others a Greek Cross would be produced in the centre opening, and crosses, similar to those carved beneath the window, in the side openings, supposing such an ornament was wanted. Although frequently alluded to by ancient writers, few remains exist agreeing with what they called the "simplex fenestra;" but it appears that in the early days of the history of coloured glass, that was the most common form; and I have little doubt that the windows of Sta. Sophia presented the primitive type of such windows as those which Benedict and Biscop, according to Bede, introduced into this country in the seventh century.

Another circumstance which corroborates my view that there was stained glass in Sta. Sophia, is that the Eastern nations generally, whose architecture was originally based on that of Byzantium, have windows cut or pierced out of stone, and occasionally made up with plaster, on the weather side of which they fix pieces of coloured glass of singular shape and pattern. Occasionally these windows are introduced in domes, and in such cases the stone or plaster inside forms the lines of the dome, and light enters through the little pieces of stained glass which cover the apertures, which are formed into simple geometrical patterns, as they would be in this pierced part of the dome of Sta. Sophia.

Those are the most important special points to be noticed, so far as the building of Sta. Sophia itself is concerned; but since its peculiarities of style and the novelties of form introduced in its construction can be properly appreciated only by contrast with the monuments which preceded it, we shall glance for a few moments at them.

One of the plates in Salzenberg's work, to which Mr. Nelson did not particularly allude, gives illustrations, showing the extent to which the Latin or Basilican arrangement was carried in the Church of Agios Johannes, built by Leo the Great, in 463, only seventy years before Justinian commenced the building of Sta. Sophia. We find in that church a perfect basilican arrangement, exactly similar to that of Sta. Agnese at Rome, with narthex, apse, choros, second story, forming galleries for females, &c. complete. A hasty comparison of the plan of this church with that of Sta. Sophia shows how the Latin mode of arrangement differed from the Byzantine, while a close investigation of the subject generally will demonstrate that, as the styles were retained clearly and distinctly in architecture, they were no less so in portraiture and ideal painting.

Proceeding now to the mosaics of Sta. Sophia itself, I will begin by describing the visitor's impressions on entering and making the circuit of the building. He first passes through a small and rather unimportant pro-narthex, or portico, which conducts him into the long gallery, which is the real narthex. As it is in this gallery that we first meet with any indication of Byzantine individuality of faith and character, I may be allowed perhaps to dwell briefly upon qualities which lie at the very root of the outward and visible forms in which much religious fervour was for ages embodied, not only by means of mosaic, but by calligraphy, sculpture in stone, metal, and ivory, embroidery, and every process by which the voice of art has ever hitherto appealed to the heart and conscience of man. Now, the great distinction between the Byzantine and Latin modes of working out religious conceptions (that is, between the Eastern and the Western modes) is, that, in the Western or Latin mode, symbolism was universal. The art of the Catacombs was followed distinctly, though frequently remotely, developing itself in mythical and sentimental forms, and systems of parallelism between type and prototype. In the Greek Church, the exposition of faith through art took a more tangible form. Symbolism was avoided on all possible occasions; and direct representation led to a partial transfer to the representation of the adoration due to the thing represented. In the advanced periods of Greek art, this realistic tendency led to a painful view of the nature of religion, more particularly in connection with the martyrdom of saints, and the physical sufferings of our Saviour and his followers, which were represented in the most positive and often repellent forms.

I stop at this point to point out that over the entrance door is to be found the only piece of symbolism throughout the building. Over that door is a small panel cut in stone, intersecting the mouldings of the architrave and containing a representation of a sort of enclosure or "cancellum," with a seat of honour, and upon it an open book with the Holy Ghost in the figure of a dove descending upon it; being, in fact, the Spirit of Holy Wisdom (to which Justinian dedicated his Church) embodied. The inscription on the book is, "I am the door for the sheep; let him who is fitted enter, and he may walk in and out, and there shall he find pasture."

Numerous doors from the narthex lead into the main building. The whole of the sides of the walls were lined with precious marbles to a certain height, and above that commenced the mosaic work. This is, like all Byzantine glass mosaic work, on *a gold ground;* but it also has the peculiarity (unique, so far as I, or anybody I know, is aware of), that it has in its patterns, in addition to gold mosaics, *silver mosaics.*

There is a very valuable MS. known as the Lucca MS., supposed to be of the seventh or eighth century, and printed by Muratori, in his great "Annali d'Italia," in which the writer gives an account of the process of making golden and silver mosaics. Both in the "Schedula diversarum Artium," of Theophilus, and in another MS. of rather later date, about the year 1200, known as the "Mappæ clavicula," or key to drawing), published by Sir Thos. Phillips in the Archæologia, and supposed to be an English work, there is an almost identical description of the art of making mosaics, but omitting any special allusion to silver work. In writing a book on the subject some time ago I mentioned this process, though I was not then aware of the existence of any actual specimen of it; and I am therefore very glad to recognise it in Sta. Sophia, since it proves that the old writer of the Lucca MS. described things which really existed, and not myths or traditions only. You will see that the silver mosaics shown in the drawing are in the great groined vault of this gallery. It is constructionally a groin as far as the middle portion, where it becomes a flattish dome. You will see how cleverly the artist has given the idea of its being a groin to a certain extent, by following the intersecting line of the vault with his decorative lines, and then has indicated its termination in a domical form, by the introduction of a central circular ornament. In this part some of the silver ground mosaic is introduced.

We here meet with a very interesting and entirely new element of design, which is totally different from any of the Roman ornament. A comparison of these with analogous Latin remains will show that the latter are almost entirely imitations of antique work; but *here*, coupled with these silver mosaics, we find a distinctly oriental character of decoration. It is again repeated in other mosaics—particularly in *this* form of leaf, which is quite oriental in character.

Now, it is a curious fact, that the year in which Sta. Sophia was commenced was the very year in which Justinian concluded an eternal peace with Chosroes Nushirvan King of Persia. We know that in one or two reigns antecedent to his Greek artists had been employed in Persia, and that there had been a friendly communication between the two countries. We may therefore assume, that when Justinian proposed to build this structure in so short a time, he not only enlisted the ability of those about him, but that he attracted back those erring spirits who had gone to seek their fortunes in other countries. He probably, indeed, employed not only his own subjects, but foreigners—and in that way we may believe that a considerable portion of what no one can fail to recognise as Oriental art was mixed with Byzantine.

The principal portion of the mosaic work in the narthex is over the centre door, which was known as the King's door; and there we find a very beautiful mosaic, which represents the figure of Our Saviour in the act of benediction.

There is a peculiarity about the mode of benediction which it may be interesting to point out. The Latin benediction was given with the thumb and two fingers extended, representing the Trinity. *Here*, however, the first finger is presented straight—representing the J in "Jesus"—the second is crooked, to form the Greek capital S in the same word—the third finger is crossed to it, but still bent, to make the Ch for "Christus"—and the fourth is bent to make the S the last letter, and in that ingenious way the benediction appears to have been given, as here represented.

The book held by Our Saviour in this mosaic bears the words in Greek, "Peace to you. I am the light of the world;" confirming the view that it is actually the representation of Our Saviour. In medallions, on one side is the Virgin Mary, and on the other the Archangel Michael holding the abacus, which was a symbol of chiefdom. There is another figure, prostrated in the Eastern manner introduced by Diocletian. There has been a question as to whom this figure represents. Salzenberg supposes it to be Justinian himself. Fossati says it is Constantine Pogonatus. I think the mosaic is certainly of Justinian's time, and that it is a *capo d'opera*—the best piece of all the mosaics and one upon which the artist would take most pains, and that it therefore probably represents the great Emperor himself. It appears to be in good preservation. Unfortunately Sta. Sophia has suffered very much indeed, and the highest class of representations is that which has been most injured; because, as the Mussulman could not bear the representations of the Giaour, they covered them up as far as possible, and damaged them wherever they could.

Passing through the King's door, and turning to the right or left, we enter the side halls which are groined over with flattened heads to the groins, just as in the narthex; and the mosaics are of a similar character. They exhibit the same principle of marking all the arch lines and the lines of the vaults, and indicating the round basin-shaped termination by a circular ornament in the centre.

It is remarkable that in these mosaics there is no religious symbol but the cross; a circumstance which does not occur in any building of the period in the Latin Church.

Leaving the under part of these galleries, appropriated to the men, for the upper part (or *gynæceum*) appropriated to the women, we find the richest kind of mosaics, placed there no doubt because they were conspicuous from the nave below through the openings between the pillars of the upper arcade. From the central point of view under the great cupola, these domes and groins would appear to great advantage and have a very beautiful effect. Here appear to have been a certain number of domical parts rising to a higher basin-shape than the lower vaults. The prints show the decorations of these parts. There are only two existing, and of them only some small fragments are perfect; but there is enough to make out that the central subject was Our Saviour, and round him the Twelve Apostles, with the fire descending from Heaven upon their heads; a representation of the Day of Pentecost. The figures in the pendentives are spectators looking up in wonder at the miracle.

These patterns are the triumph of the whole series of illustrations of surface decoration. They are singularly beautiful, and in them we find the taste of the master architects themselves displayed, who no doubt gave the predominant lines; and we see, as might be expected from Anthemius of Tralles and Isodorus of Miletus, a remarkable retention of Greek forms, as in *this* moulding; while in others an oriental character is introduced apparently by the workman or "pattern drawer," an occupation which has ever remained distinct in the East from that of the architect or builder.

The central nave has a great semi-conch at each end, with subsidiary conchæ opening into them. From the springing level of the greater conchæ the pendentives start, and over them rises the main dome. It appears that the decoration of both conchæ and of the great hollow of the roof, was plain gold ground mosaic. The main western and eastern arches were ornamented, but both of them were executed at a period subsequent to that of Justinian, or at any rate some accident may have happened to them, and what now appears is of a later era.

The principal mosaics of this part of the central nave are between the windows. Underneath the windows are a series of Greek saints in arched recesses, St. Gregory, St. Nicholas, St. Basil, St. Anthemius, and others. The figures are very dignified; they wear the pallia so conspicuous in the bishop's dress of the Greek church. Above them stand the twelve minor prophets, and at the ends are two larger figures on each side, representing the four greater prophets. Above are some slight remains of four figures, supposed to be the four evangelists.

In the pendentives there are enormous seraphim. *Here* is a representation of the head of one of them, and *this* drawing shows the way in which their wings are combined. These figures are of immense scale, and fitly carry up the eye to this "empyrean"—(the dome itself). The effect produced in this dome by the cross lights admitted through the coloured windows at its base, must have been that of an air of mist and rainbow-tinted vapour, so that any great picture at the summit would appear to be floating in it, especially if the glass contained a predominance of blue. The The ancient writers describe a great figure of the Almighty in this place. So that, in looking at this series of mosaics, we ascend the gradations of the saints, the prophets, and the evangelists to the abode of Deity itself;—a very beautiful conception, and very beautifully worked out.

As we enter the bema or sanctuary, we find that *here*, over the high altar, stood guardian angels. The whole arrangement of the east end is very simple; there is no dramatic story told, but the treatment is noble and impressive.

Architecturally speaking, there is great ability displayed in the introduction of lines of colour on the ribs of the great dome, to give the gold which occupies the spaces between the ribs tint and substance. The rib patterns are shewn on the drawing. The detail looks coarse, but as it was very distant from the eye, the forms and colours required to be strongly contrasted.

This is a section through the windows at the base of the dome. As the light played on their illuminated jambs or sides, and flowed across this coloured work, the effect must have been quite exquisite.

The two main arches having to do the principal work in the support of the dome have suffered most, and have consequently needed reparation. This western one was repaired in the time of Basil the Macedonian, late in the ninth century. The other or eastern one was restored in the time of Johannes Palœologus (about the year 1345). The first of these has in the centre a representation of the Virgin Mary, with St. Peter and St. Paul on each side, and two other figures which are not very clear. On the other is a representation of a sort of throne which is very much defaced, and figures of the Virgin Mary, St. John the Baptist, and Johannes Palœologus himself, who repaired the arch. The presence of the Virgin as she is represented in the picture would at once indicate a later date than that of Justinian, even if we did not know the exact period of its execution.

I have hitherto only alluded to the gold-ground mosaics; but they are by no means the only kind of decoration, as up to the height of the springing of the main arches supporting the dome, the whole wall is covered with slabs of precious marbles, no doubt in imitation of the wall-covering that helped to make the Pantheon so celebrated a monument, and so worthy of imitation by all the eastern successors to the glories of Rome.

The mosaics of all this wall-covering are very interesting, because they consist not only of slabs of marble put together like the antique, but of marbles cut out and fitted into each other, like Florentine mosaic. In addition to this, in *pietra dura*, there is a curious mosaic made up with a resinous composition. It forms the spandrels of the arches of the *gynœceum*, and other places. Some of the lines in these ornaments are so fine that it was necessary to cut it out of very thin marble indeed, and of various thicknesses. As it was difficult in such delicate work to pierce a thick slab truly, the slabs were thinned down in parts to $\frac{1}{4}$ or $\frac{3}{8}$ of an inch; and where the line required to be very thin, the marble was sloped away at the back and cut through clean. Resin mixed with marble dust and other substances was poured over it to make what would be less than $\frac{1}{2}$ an inch thick into the thickness of about 1 inch. It was then fastened to the wall with cramps, and more hot resin was poured behind the cramps to make the whole secure. The patterns of this style of work are curious, as they have a mixture of the old Greek in them.

The drawings show the principal details of the pictorial mosaics. *Here* is one of the greater prophets, which displays a fine dignified character. *This* is the arch of Basil the Macedonian. *Here* we have the Jewish type of the Madonna, the head covered exactly in the manner delineated by Michael Angelo, who perhaps more than any other artist of the revival clung to the Byzantine type, as in the head of his Pietà, which you will remember has a youthful expression, and a head-dress exactly resembling *this*. There is very little left of this arch, but it belongs to a good period, whereas the arch of Johannes Palœologus is a specimen of an already decrepit school of art.

I may observe in reference to all the mosaics of Sta. Sophia, that their workmanship appears to be excellent, both as to the putting together, or "commettitura," on which the Italians pique themselves, and the general drawing; there is none of that bad colour, and weak repetition of line to mark the drapery, that we find in the later Byzantine works. This early and noble style asserted itself in perfection at this, the highest period of its development.

The pavement of Sta. Sophia was executed very much upon the principle of the pavement of the Pantheon at Rome. It was not so much *opus Alexandrinum*, made out of small pieces of porphyry and serpentine, as of large slabs put together, and forming the pavement known to the ancients as *opus Sectile*. In the church of Agios Johannes (built as I have mentioned, about 70 years before Sta. Sophia), the pavement is filled in with small mosaics, in the regular Latin style, similar to that which was originally introduced at Rome by Alexander Severus. The pavement of Sta. Sophia appears to be in the style specially affected by the Greeks, since it is similar to that followed at S. Marco, which was originally executed from Byzantine models, though doubtless repaired in many parts by Latin workmen.

I trust from the description given that you may now be in a position to form a tolerable general idea of the decorative features of Sta. Sophia, and I will therefore proceed to advert to the historical position which these mosaics occupy.

As we have given (as everybody who looks at Sta. Sophia must) the highest credit to the Byzantines for architectural originality in every form,—in capitals, mouldings, &c.,—they can afford to spare a little of the reputation usually attributed to them of being the only mosaicists. Writers constantly allude to "Greek mosaic," as though there were no other kinds. It is to be remembered on the contrary, that the gold-ground mosaic was essentially an old Roman art. We know that Pliny describes distinctly the introduction by Agrippa of glass mosaic; and we know that the most ancient mosaic was known as *lithostratum*, being made of stones, and was taken from the Greek. As the exigencies demanded by improvements in the art went on, more colours were wanted than could be found in natural substances, and to supply such wants fictile materials were invented. In such glassy substances the Romans produced all the colours employed in the most celebrated antique mosaics, such as Pliny's Doves, the battle of Issus, &c. Pompeii contains numbers of specimens of gold-ground mosaic, perfectly well made, as pure in colouring, as little obscured as when they were first executed, and as excellent in every technical respect as any of the best Greek mosaics. We know that in the house of which Mr. Falkener gave such a beautiful illustration in the Exhibition of last year, there were four columns entirely clad with mosaics. A very elaborate specimen of a column decorated with patterns introducing gold-ground mosaic has been lately put into the museum at Naples, and in the house of the greater fountain, and of Medusa there are noble fountains with "conchæ," thoroughly well enriched with mosaics. Pompeii was overwhelmed in the year 79; and therefore in the interval between that date and the time of Constantine,—about 330—a very considerable progress might have been made in the art, especially at a period when richness was sought for rather than beauty. From these and other facts it is perfectly clear that the Romans had an immense number of workmen perfectly competent to carry out works in mosaic when Constantine removed the seat of empire to Byzantium. One fact may be mentioned strongly corroborative of this view; namely, that at Rome, whoever wishes it, may find them himself, or have shoals of fragments of gold mosaic brought to him. The poets allude to it frequently, and it is clear beyond all question that the *vitreæ parietes* were essentially Roman.

When Constantine went to Constantinople, he took a certain number of work-people with him, but perhaps not the greatest number of those who worked at Rome; and even up to the time of Sta. Sophia I believe the mosaics were worked by the regular descendants of the Roman mosaicists, and not by Greeks. We may indeed state broadly that up to the year 500, almost all the churches in Italy were decorated by Roman mosaicists, and after that time by Greek artists. The oldest example of all is Sta. Costanza, the funeral chapel built by Constantine for his sister, adjoining the church of Sta. Agnese at Rome, and there we find the subjects of the Catacombs reproduced. The colours are black and white, as in the remains of the baths of Caracalla, and the subject is a large vine, trailing over a "pergola" or frame-work, and between the branches are genii eating the grapes. The meaning of this is of course the faithful living on the benefactions offered by the church. It is a subject of frequent recurrence in the Catacombs. I need scarcely observe that angels were not depicted till a later period, and the angelic idea was therefore expressed by children, or *amorini*.

It may be desirable, before I proceed, to recall some of the subjects of the Catacombs, because, as I have already observed, they gave the first tone to all the early Latin mosaics. The Christians of the first three centuries in their shelter in these caves, were afraid to express openly the doctrines which they held, they therefore veiled or concealed their sufferings, preferring to proclaim rather their faith in the happiness that awaited them. Thus we find the idea of the Saviour is expressed by a representation of Orpheus winning all to him by celestial music. Again we have him as the Good Shepherd with his sheep, or disciples; we have representations of a large cup with birds drinking from it, indicating the faithful receiving the sacrament, and stories from the Old Testament, all of which find their counterpart in circumstances connected with our Saviour, but there is no direct representation. Where the resurrection is expressed, it is frequently under the image of the raising of Lazarus, or the escape of Jonah from the whale's belly. Everything is expressed under a symbolical form, and Christ himself is represented invariably "imberbis," and arrayed with eternal youth.

There is no doubt the early Christians followed these types for some time; hence the number of representations of the cross, the vase with birds drinking, green fields with sheep feeding, &c., which are constantly found in all the Latin mosaics.

After Sta. Constanza, there is a considerable interval, till we come to the Church of Sta. Agatha at Ravenna, A.D. 400. Then there is Sta. Sabina at Rome, A.D. 424, where the mosaics formed a series of portraits in medallions, quite after the antique, going round the triumphal arch, (which was the great arch in the basilica, somewhat in front of the bema), and upon that were usually placed representations from the Apocalypse. That practice prevailed from about the year 400 to about 800.

The principal mosaic however which remains to us of this early time is that of Sta. Maria Maggiore, executed in 432. The mosaic over the triumphal arch contains the usual apocalyptic subject, supported right and left by a series of biblical compositions, and along the sides of the church, under the windows, is a series of subjects from sacred history, in which the whole of the figures recall very forcibly those of the column of Trajan, as best known to us in the engravings of Pietro Santo Bartoli. The whole of these are completely Latin in the mode of drawing and design, and as purely classical as the drawings in the Florentine Homer and the Vatican Virgil. It is in fact debased Roman, both in form, colour, and mode of working; and, as Lord Lindsay remarks, none of the compositions became traditionary in Greek art.

At the same time as this work of Sta. Maria Maggiore was carried out, the great mosaic of S. Paolo fuori le mura was executed under the auspices of Honorius, son of Theodosius.

About 440 Honorius removed the capital of Italy to Ravenna, where his sister, Galla Placidia, who was a very devout woman, (or paid largely for the credit of it), built and endowed many religious edifices; and we find an interesting and curious series of churches. The most interesting is the Tomb which she built for herself, her husband, her brother, and her son. It is a sort of cruciform building, with four arms, projecting in the form of a Greek cross. The subjects of the mosaic decorations are symbolical, and similar to those in the catacombs; one of the leading subjects being Christ feeding birds and lambs. These I believe to have been purely Latin works.

There is a Baptistery at Ravenna, the mosaics in which are similar to these at Sta. Sophia. We have in the summit of the dome our Saviour with John the Baptist, and beneath all the Apostles stand around. In the time of Placidia, or of her successor, Theodoric, who took Ravenna, churches were begun which were interrupted by the conquest under Justinian. From that date, 553, that monarch caused an exceedingly interesting series of mosaics to be carried out at Ravenna, corresponding of course closely with those of Sta. Sophia.

The most important Latin mosaic is one executed in the Church of S. S. Cosmo e Damiano at Rome about two years before Sta. Sophia was begun. It is probably the largest and most elaborate of all the Roman mosaics; and there, it appears to me, the Latin power spent itself; since in the next century we meet with scarcely any instances of mosaic works executed in Rome. It appears probable that the great works of Sta. Sophia and of the Imperial Palace, in the first instance, and of the church of S. Sergios (which is similar to and cotemporary with S. Vitale) and the churches executed at Ravenna, engrossed the labour and energy of all the principal mosaicists; drawing from Italy all the best artists, and retaining them for generations in the Imperial service, until indeed the Latin spirit died within them, and they became transformed into Greeks outwardly and inwardly.

The details are too long to go fully into, but I may mention generally that in the early Latin works the shading is marked by tints, and not by lines. In the later works produced by Greek artists we recognise a singularly liney manner. In the early specimens one part is lighter or darker than another, and forms are defined by a traditional chiaro-scuro, and not drawn as it were by an outline draughtsman. If we examine the MS. from Mount Athos, published by M. Didron, we find that the writer gives an account how the Greeks proceeded in their painting, and that it was done by a series of outlining and gradual painting in; precisely similar to what may be traced in the later Greek mosaics, and not in those done upon the Roman principle.

Now, in these churches at Ravenna, the most interesting of those executed after the mosaics of Sta. Sophia are the mosaics of S. Vitale, which are peculiar for containing two portrait representations on each side of the bema, or apse. On one side stands Justinian, attended by Maximian, the high priest, who brings offerings to the Church. On the other side is Theodora the Empress, advancing with her attendants on the same errand.

There are two churches of S. Apollinare at Ravenna, the one "di Fuori," and the other "di Dentro." The former is the earlier of the two, and contains more symbolical representation than any Greek mosaic I have seen. It seems (when contrasted with the mosaics of Sta. Sophia) that on Greek ground the designs of the Greek artists were simple, but that when they came under Latin influence, they became more complex and symbolical in their modes of representation. This is especially the case in the Greek mosaics executed in Rome during the Iconoclastic troubles; the subjects having no doubt been prescribed by the Latin Clergy. One of the most beautiful subjects in S. Apollinare di Dentro is a row of Saints under the windows of the nave. At the west end of the church is shewn the Palace of Justinian, and on the opposite side stands the part of the town called "Classe," and these figures seem to march in a grand line towards the east end of the church. On the women's side, terminating the composition, is the Virgin Mary, with our Saviour in her lap, and opposite her, our Saviour seated in glory. Of course this representation of the Virgin is curious, because it is one of the very earliest that exists of a subject which ultimately became exceedingly popular. In the Council of Ephesus, A.D. 431, the Virgin was for the first time allowed to be depicted holding the Saviour in her arms; and this is one of the earliest appearances of her figure after that edict.

Returning to Rome;—we left off with the mosaics at S. S. Cosmo e Damiano (executed about two years before the building of Sta. Sophia); and from that time until about the year 620 hardly any mosaic was made in that city. Some were then executed at S. Lorenzo fuori le mura, at Sta. Agnese, and at the Oratory of S. Venanzio in the Lateran; but they are of minor importance, and it is clear that the great works were then going on at Ravenna, and in the provinces, subject to Greek rule,—the tendency in all these was towards direct representation, and adverse to symbolism, as is proved by the injunction of the General Council of Constantinople, A.D. 692, which authoritatively prescribed the former, and abjured the latter principle. Thus for a time there was a lull in matters of art throughout Italy,—and then broke out the iconoclastic troubles,—about the year 700, which drove all the figure artists out of the Greek Empire. On the occasion of their spread throughout Italy, began what may be considered the great series of Roman mosaics, in the churches of Sta. Prassede, Sta. Pudenziana, S. S. Nereo ed Achille, Sta. Maria Nuova, Sta. Maria in Domnica, S. Marco, the Triclinium of S. Leone, and many more in the same style. They contain frequently a large representation of our Saviour, or of the Virgin Mary, as the principal figure, and sometimes a green field with our Saviour and his sheep; Apostles and Patron Saints stand side by side, with occasional recurrences of the earlier symbols,—the execution of the whole being rather liney than in masses.

Returning to Byzantium, we find that Greek art does not appear to have reasserted itself in the treatment of pictorial subjects till about 120 years after the publication of the edict against the image painters and makers. The Empress Irene found that the feeling of the people was in favor of a somewhat sensual indulgence in pictures and statues, and it was agreed at a General Council that paintings should be introduced, but not statues. A discussion of the subjects then began, and authority was given for a certain series, which are embodied in the celebrated "Menologion," one of the most valuable MSS. in the Vatican Library. All the sacred acts depicted are recognized by this as allowed to be painted, and they form the staple materials of ecclesiastical decoration throughout the Norman and early Teutonic periods, and all the middle ages.

After the close of the ninth century, during which almost all these great mosaics were executed in Italy by Greek artists, who found very little employment in their own country (the Greek Emperors declining in power) there was again a great lull till about the year 1100. It is true many Greek workmen were employed at Venice about 1020, going steadily on at S. Marco, till 1200 or 1300, both with carved stone-work and glass gold ground mosaics; but their early specimens in the eleventh century were very poor. At the commencement of the twelfth century came an after-crop of Greek art, the great example of which is in the church of S. Clemente, about which Lord Lindsay is so enthusiastic. As far as mechanical execution goes it is very beautiful—there are a number of little figures of animals and birds of all kinds very delicately executed, and quite reviving the manual dexterity of the best Roman time.

I need scarcely remind you that it was from these artists at Venice that the art of working in mosaic was acquired by Italian artists. Greeks were brought from Venice to decorate the Baptistery and the church of S. Miniato at Florence, and they became the teachers of the great Italians—Mino da Turrita, Andrea Tafi, Gaddo Gaddi, and others. Furthermore, I have little doubt that the processes of glass-working, which have made the glass of Venice so famous, were almost all derived from Byzantium.

In reference to these Florentine monuments it is curious to notice the occurrence in Tuscany of a peculiar kind of carved work, cut out with a drill and filled up with mastic, which has puzzled other travellers as well as myself to account for. It may be seen in the pulpit of S. Miniato, and is precisely identical with the carving of foliage, and the mastic inlaying I have pointed out as occurring in the arch spandrels of Sta. Sophia. It occurs also in the font in the Baptistery at Pisa, and I have seen it at Messina. Until I had an opportunity of looking carefully into the details of Sta. Sophia I was unable to find out whence it came, and I was of course pleased to recognise it.

In summing up the general artistic features of novelty presented to us in Sta. Sophia, there are four points (in addition to the great structural novelties) to which I would direct special attention. The publication of M. Salzenberg's detailed drawings and descriptions, if it has done no further good, has at least made it pretty clear that we are indebted to these Byzantine Greeks and to the great impulse given by Justinian;—in the first place, for the introduction of all the processes of Florentine mosaic;—in the second, as I believe, for the introduction of stained glass into church architecture;—in the third, for the peculiar mode of sinking carved work beneath bounding lines of form;—and in the fourth place, for the liberties of direct representation of basket work and other novel features in the capitals and sculptured ornaments.

I shall now say a few words about the technical execution of these mosaics, to which I would specially beg your attention; because I see no reason whatever why we should not practise in the present day exactly what the Greeks and Latins practised of old. The dome, arch, or conch, was built with brick or stone, and rendered with rough plaster to make a key for subsequent coatings. Then a strong and fine plaster nearly an inch thick was put upon it. Cartoon or drawings were made, to assist in transferring the subjects to the wall, or they were drawn on the plaster itself;—then, beginning with the most important part, the artist knocked out with his chisel a piece of the plaster corresponding in size to that which would be occupied by a few tesseræ. He then went to the trays in the compartments of which the coloured glasses were sorted, and selected a piece of the vitreous material of the proper colour, which might be of the size of a circle 5 or 6 inches diameter and half an inch thick To cut this to a particular shape he used a particular apparatus. Placing the piece of mosaic upon a sharp edge of iron, and striking it with an edge tool exactly plumb with the under iron, he fractured it in a direct line between the two edges. This was the later method, but an earlier one was to draw a hot iron along the line in which it was desired that the material should be fractured. Having thus the small piece he wanted, the artist took some fresh cement (made of 1 part of lime with 2 of marble dust), inserted the piece, and pressed it till it was flush with the adjoining plaster, and he could see whether more cement was wanted, and how the mosaic was bedded; and so he proceeded till he had finished a face, or some other leading feature, when he left off to commence in another place, allowing an inferior hand to work upon the draperies, &c.

We may as well remark, that in the ancient mosaics the cement was made as above described. In the middle ages it was made with lime and travertine stone; and still later, where the work was very fine, and it was wished to retard the setting, lime and linseed oil were used, so that the mastic remained soft all day; and the mosaics might be eased as they were respectively bedded. There is one peculiarity of treatment which was universally observed; namely, if the artist had to execute a profile of any kind, all the longitudinal joints of the flesh would be parallel to the contour; but instead of the joints of the gold ground abutting directly upon the contour, they followed round it, parallel to those of the outer flesh colour series: the great object of *this* line of gold ground mosaic was to prevent any interference by the joint-lines of the general ground with the repose of the heads. An inferior workman, who had his cubes of gold ground mosaic ready cut to a rough square on the surface, then put them in as fast as possible. That completed the work, and it set, as we see, for ever. Could we but add up the sums which we pay for painting and repainting our monuments, I think there cannot be much doubt we should find that it would have been far cheaper to have executed our decorations in mosaic.

Some of the mosaics at Sta. Sophia have a peculiar character, which M. Salzenberg observed by the aid of the scaffolding for the repairs; namely, when the mosaics can only be seen from beneath, at an angle exceeding 45 degrees, the pieces are arranged with their upper edges set forward from the wall face in tiers, farther and farther apart, as the angle of vision is increased. By this means the work is saved on much intervening space, and both material and cost economised—

in some parts to the extent of two-thirds of the whole. This method had also the advantage of reflecting the light at a better angle to the eye.

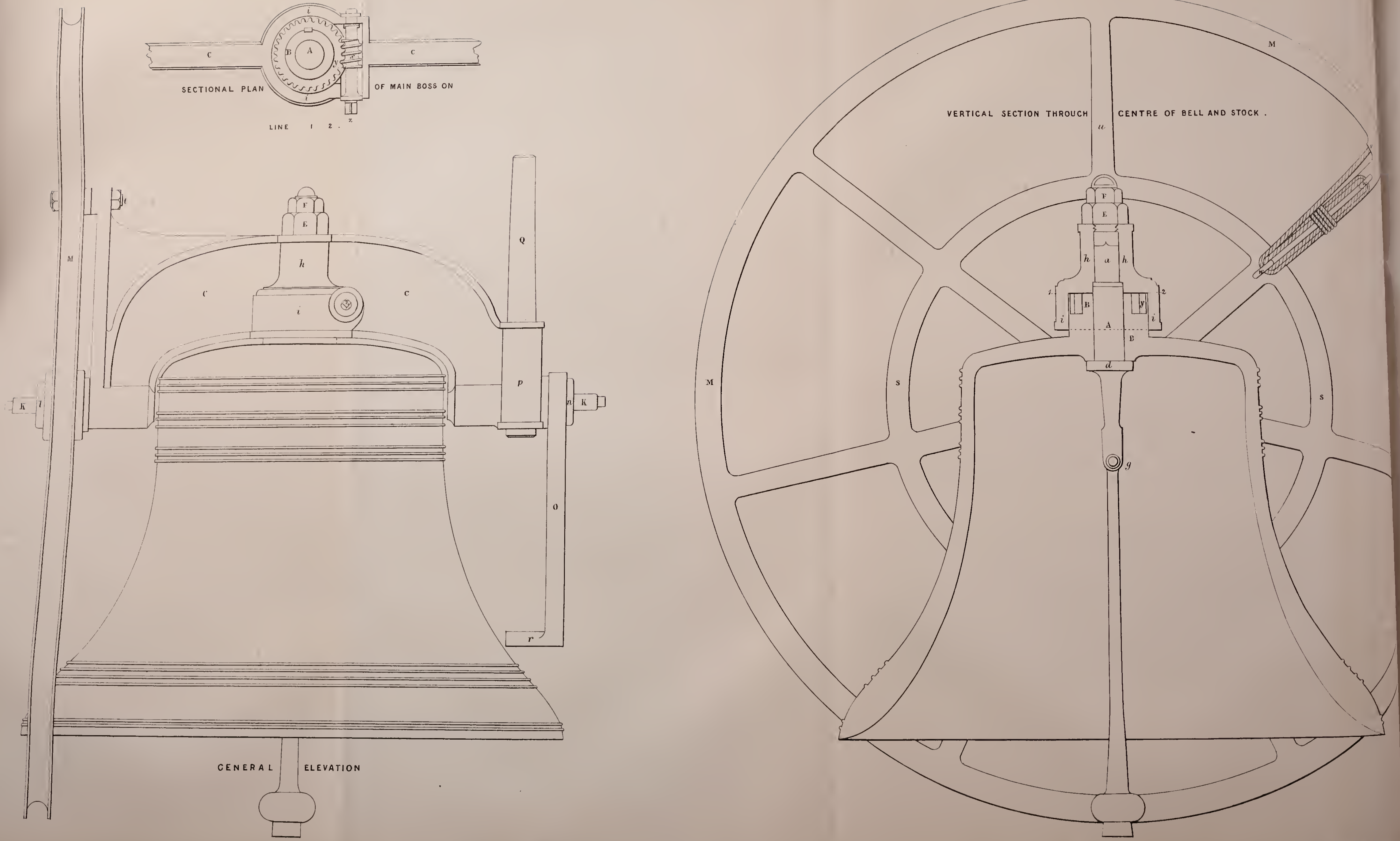
These, I think, Gentlemen, are the principal technical points connected with mosaic in general, and Sta. Sophia in particular. The hands of the clock forbid my trespassing longer upon your time; but I must, in conclusion, beg you to attend for one moment to what I venture to call the moral of Sta. Sophia. I know of no monument which so satisfactorily and honestly answers the purpose for which it was built; or which so completely expresses in every way its construction and intention. By the exterior you perceive exactly what it is internally; there is no fudge, no sham, no concealment about it. Every material is fire proof; and one ever memorable fact about it is, that although Justinian sent out in all directions for the old materials of temples, precious marbles, and everything of the kind that could be found, I am not aware that there is any piece of old work used in its original state, throughout the whole building. If the artists who designed and executed Sta. Sophia were influenced by tradition, they were, at any rate, no blind copyists; they set a far nobler example to those who succeeded them then Constantine had to those who followed him;—would that the art of the nineteenth century in this country could stand the test of comparison as satisfactorily! Let us remember that it is only by equal truth, honesty of purpose, and originality, that we can ever hope to see realised the day-dream of a Sta. Sophia of our own.

Before sitting down, Mr. WYATT added a few words as follows:—

I omitted to mention that I have here some specimens of the actual mosaics of Sta. Sophia, contributed by Mr. Scoles. Mr. Poynter has many of them. The old treatises (as I have already observed) contain descriptions of the mode of making them. One was to take a sheet of ordinary glass, about half an inch thick, and upon that to lay gold leaf, upon that again to spread a very thin sheet of pure crystal glass, and to put the whole into an oven and burn it into one mass. Another mode was to take ordinary clear glass, made (by the addition of a little more lead) fusible at a lower temperature; to pound it to a powder, and then to spread the powder over the glass mosaic, so as to produce a thin film; and I think that was the best way, as it is very similar to the lead glaze that we put upon common pottery. As a general rule, the older the mosaic the thinner the covering of crystal glass. We can almost tell whether it is early or late by the thinness and clearness of the covering. In Mediæval and Italian mosaics, such as those of Sicily and the Basilicata, the gold leaf is extended upon a common brown ware, of silicious quality, but unlike that of the ancients.

Mr. WYATT concluded by offering to answer any questions which might be put to him upon the subject of his address.

The CHAIRMAN, Mr. Papworth, Fellow, observed, that an important element in the consideration of such questions as the present, was to ascertain where any particular practice came from, and what was the use of it. This Mr. Wyatt had done, and he had, moreover, illustrated the ethnological view of the subject in showing how different styles had grown by the intercourse of various nations. Thus it appeared that the artificers of Justinian were embued with an oriental feeling derived from Persia; and thus the decline of art, in consequence of the iconolastic persecution, had been referred to. He believed Mr. Wyatt had stated that the use of mosaic was a mark of a degenerating civilization; and he (the Chairman) would accept that observation literally as the fact; but if he had misunderstood Mr. Wyatt on that point, he should be happy to be set right. With reference to the contrast between the Classical and Byzantine principle of decoration, he believed there were instances in the former in which foliage, &c. had been cut out of, instead of being superadded to, the solid mass.



SECTIONAL PLAN OF MAIN BOSS ON LINE 1 2.

GENERAL ELEVATION

VERTICAL SECTION THROUGH CENTRE OF BELL AND STOCK.

DRAWING SHOWING A BELL & ITS MOVING GEAR COMPLETE.

Vincent Brooks, Day & Son [illegible]

A DESCRIPTION OF SOME ALTERATIONS IN BELLS, AND BELL MACHINERY.

By W. L. Baker, C.E.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, March 5, 1855.

Before commencing this subject, I wish to observe that the alterations to be described were planned for the purpose of improving, and not of radically changing the existing system of bell mechanism; and that they are not intended to supersede the athletic exercise of bell ringing, but on the contrary to furnish the ringer with a more perfect instrument. They will at the same time render bells, which are very expensive articles, much more durable, simplify their gear, and render it more impervious to the inroads of time and weather, and less liable to derangement. The art of bell-hanging, simple as it may at first appear, involves more theoretical investigation and more practical knowledge than perhaps those who have not studied the subject, or had practical experience therein, can be aware of; but the alterations I have to propose are the results of observation and practical experience, gained in the ringing-room and in the bell-chamber. Before entering upon the particulars of the alterations, it will be desirable to describe the principal features and details of the ordinary system of bell machinery, the uses of its various parts, and the manner in which a bell is rung.

A bell hung in the ordinary way for ringing is suspended from, and firmly secured to a wooden beam called the stock by means of long iron links; the lower ends of these links are attached to ears technically called cannons, cast on the crown of the bell, or to cross-bars passing through the eyes of the cannons; the upper ends of the links, which are screwed, are passed through iron clamp plates bedded on the top of the stock, and are secured by nuts which are screwed with the aid of a spanner down to the clamps, until the tops of the cannons are pressed firmly up into a recess cut in the under side of the stock, so as exactly to suit their shape. The length of the stock is generally about two or three inches more than the diameter of the mouth of the bell, in order to give clearance between the skirt of the bell and the framing. At each end of the stock, and at the lower part of it, is fixed a pivot or gudgeon, which rests and turns in a brass bearing fixed in the framing. A large rigger wheel is attached to the stock, and by means of a rope connected with a particular part of the periphery of this wheel, a ringer is able to put the bell into a state of oscillation. After a few primary impulses a firm stroke is given to the bell by the clapper just at the completion of each arc of the bell's oscillation. The impulses being continued by the ringer is technically called raising the bell, because the centre of gravity of the bell at every successive impulse describes a larger arc, and at the termination of every oscillation is raised to a higher point than it had previously attained, until the arc of oscillation becomes a complete circle, and the bell is brought, at the termination of each oscillation, into a position of stable (?) equilibrium, the mouth of the bell being upwards. By allowing the bell to pass a little beyond the vertical line, the ringer is able to hold it in a state of rest. This is called setting the bell. When this has been once accomplished, an expert ringer is able, with very little effort, to pull off his bell again with just so much force as will make it retrace its path and ascend on the other side, until it arrives again in a vertical position, and he can set it at every oscillation, and consequently at every stroke of the clapper. The bell is thus in a state in which he has a considerable control over its movements, for although the ordinary oscillations of the bell are nearly isochronous, he can shorten and accelerate them by checking the rope, lengthen and render them slower by giving the bell more rope, or stop them altogether by setting the bell; and these various alterations in its movements may be made with a moderate amount of exertion on the part of the ringer, because the impulses necessary to produce them are given at the commencement, or near the termination of the bell's oscillations, when the vertical distance through which the centre of gravity of the bell passes is much shorter than the horizontal distance. Change-ringing could not be accomplished without the control which is thus given to the ringers over the movements of their bells. In simply ringing a bell after it has been raised, the only resistance to be overcome is that of the air acting upon the moving bodies of the bell, wheel, and stock, and the friction of the gudgeons, and although these resistances are scarcely felt by the ringer in ringing a well hung bell for a few strokes, they begin to tell upon him if he continues ringing some time. One object therefore to be aimed at in hanging a bell, is to reduce these resistances as much as possible. The stay is a simple adjunct to a bell's gear, consisting of a vertical bar of wood attached to the stock, and projecting somewhat above it. When the bell is set, the extreme end of the stay comes in contact with a moveable stop attached to the framing, which prevents the bell from overturning, and eases the ringer of the trouble of holding his bell when set.

I have thus briefly adverted to the principal features of a bell's gear, their uses, and the way in which a bell is rung, in order to be able to explain more clearly the alterations now to be described.

Instead of the cannons mentioned before, a strong circular boss, B, concentric with the vertical axis of the bell, is cast on the crown, and in place of the links and clamps before described, a single bolt, A, with a thread and nut, E, at the upper end, is used for the purpose of securing the bell to the stock; this bolt is passed up through the centre of the boss, B, and the stock, C, till the collar, *d*, forged on the bolt, comes in contact with the underside of the crown of the bell; the nut, E, is then screwed down upon the top of the stock, and the top of the boss, B, brought thereby into firm contact with the stock to which the bell is thus securely fixed. When the nut, E, has been screwed firmly down, the check nut, F, should be screwed down tightly upon it; this will prevent the nut, E, from unscrewing, a frequent occurrence in machinery in motion where check nuts or keeps have not been provided. The lower end of the bolt, A, is prolonged sufficiently and formed into a joint, *g*, to carry the upper end of the shank of the clapper. The stock, C, instead of being made of timber, is cast in iron. It has a central boss, *h*, to receive the main bolt, A, and the lower part, *i*, of this central boss is sufficiently enlarged to receive the bell's boss, B, so that the lower edge of the stock may be brought down to within an inch of the crown of the bell. The two gudgeons, K K, are securely fixed in the ends of the stock by being turned to fit slightly tapered holes, into which they are tightly driven and fixed by their inner ends being rivetted over or pinned in; the stock with the gudgeons fixed in it, is then put into a lathe, and the gudgeons turned accurately true to one another, both as regards their diameters and concentricity; at the same time the end, *l*, of the stock is turned to suit the hole in the central boss of the rigger wheel, M, and the other end, *n*, is turned to enter the eye of the catch, O; a socket, *p*, is cast in the stock to receive the lower end of the stay, Q. When the bell is set, the upper end of the stay rests against the tail, *r*, of the catch, O, which itself rests against a stop on the framing. The rigger wheel, M, is of cast iron; it has seven arms, and an inner circle, S. It is put into a lathe, checked truly, and then the central boss is bored out. It is attached to the upper part of the stock by a bolt, *t*, passing through a boss at the intersection of the inner circle, S, and the vertical arm, *u*, and a corresponding boss on the stock. The rope passes through a hole at *v* into the groove of the wheel; *w w* are hooks attached to the wheel, upon which the ordinary quantity of surplus rope may be wound. This completes the description of my alterations in bells and their gear. The small and simple apparatus which remains to be described is an addition to the ordinary gear of a bell, and consists of an endless screw, *x*, fixed in a boss in the stock, and made to gear into a toothed wheel, *y*, keyed into the central boss, B, of the bell. The outer end, *z*, of the endless screw's spindle is made square to receive a spanner or wrench with which it may be turned by hand, and through the medium of the toothed wheel move the bell round horizontally on its vertical axis, in order to present a fresh part of the sound-bow to the wear occasioned by the clapper. The main bolt, A, forms the vertical axis, and is prevented from turning with the bell by being made square at the part, *a*, in order that the joint, *g*, of the clapper should always be in the same plane with the gudgeons. The following advantages are obtained in this system of hanging bells.

To cast a central boss is a much more simple operation than to cast cannons on the crown of a bell, as the latter are complicated and expensive to mould, and without care are liable to turn out faulty. The method of attaching the bell to the stock is rendered much more simple by using one main bolt, instead of six to ten links, with their necessary nuts, clamps, and cross-bars; one large bolt is also more secure than a number of small ones, which, in all probability, will not all be screwed up equally tight, and consequently there will be a greater strain on some than on others. The stock of a bell, which is generally more or less cranked, has to stand considerable strains and counter strains, and when made of timber, the bell and wheel are attached to it by iron bolts and fastenings. To insure sufficient strength, it is therefore necessary that a tough and hard wood should be used. Elm, possessing these qualities to a greater extent than any other available wood in this country, is that most approved of for the purpose. But elm is one of the worst woods for swelling, shrinking, and warping, when exposed to variation of temperature and moisture, the consequence is that, as the summer advances, all bolts and iron fastenings connected with the moving gear of a peal of bells get loose and require tightening up. The gudgeons also being let into the stock, and bolted to it, are consequently thrown out of truth, and this cannot be permanently rectified in a wooden stock. The Reverend W. C. Lukis, in his paper on bells read before the Wilts Archæological Society, on the 13th September, 1854, very justly observed,—"Bells require very constant attention to keep them in proper ringing order; when you consider their enormous weight, the different parts of their harness, the iron and wood of which it is composed bolted and screwed together, the frame-work on which they hang, and which in revolving they violently shake and vibrate, and then reflect that the iron and the wood are both exposed to continual changes of atmosphere, when one of those materials expands the other contracts, and that then the bells cannot oscillate so easily, you will form some idea of the care and attention they require to keep them in ringing order." But all the defects which thus attend the use of wooden stocks and wheels are completely and effectually remedied in properly constructed iron ones, because the whole of the moving gear is then made of the same material, the various parts of it expand and contract equally, and when they have been once properly secured and bolted together, they remain so under all circumstances of temperature or moisture. Cast iron stocks have great rigidity, and are not liable to warp. The variations caused in them by the extreme temperatures of winter and summer are exceedingly small, and the expansion and contraction is always of a regular nature, so that neither the gudgeons nor any other parts are ever thrown out of truth. Cast iron stocks have the further advantage of rendering the gudgeons capable of being simply and firmly fixed, and accurately turned, and their lateral surface is about four-tenths of that presented by wooden ones, and they consequently offer a proportionately less resistance to the air when the bells are being rung. The advantages therefore of the exclusive use of iron as the material for the moving gear of bells, are greater rigidity and durability, gudgeons permanently true, and a reduction of atmospheric resistance. A peal of bells would also be rendered fire-proof by the further addition of iron framing.

It is well known by those who are conversant with the subject, that the clappers of bells, by constantly striking the same parts of the sound-bow, wear two indentations, which may be found oftentimes three-quarters of an inch deep or more in bells that have not been cast more than from thirty to fifty years. These indentations must necessarily weaken a bell considerably in the very part that has to sustain the blows of the clapper. It is not uncommon in examining large bells to find that it has been thought prudent or necessary to quarter them, that is to turn them horizontally one quarter round, in order that their clappers may strike fresh parts of the sound bows at right angles to those they previously struck. This alteration is attended with much trouble and expense, for the following reasons :—First, the cannons are cast to suit properly only one way of fixing the bell to the stock, so that when the bell is turned one quarter round, it is not so convenient to attach the links and fastenings, and the recess in the stock has to be refitted to the cannons. Secondly, the iron links and fastenings require alteration. Thirdly, the iron staple from which the clapper is suspended, being cast in the crown of the bell, is consequently moved round with it, and therefore it is found necessary to bolt an extra piece to it so as to form a new joint for the clapper, at right angles to the old one. After all this trouble quartering is at the best an incomplete remedy, because it presents a fresh part of the sound bow to be also beaten into holes by the clapper. But when a bell is hung upon one central bolt which forms a fixed axis upon which it may be moved round, quartering is no longer necessary, because by turning the screw provided for the purpose, a man can at any time with great ease present any part of the sound-bow to the action of the clapper. Thus by proper attention the clapper, instead of producing two deep indentations and ultimately cracking the bell, may be made to wear the whole circumference of the sound-bow equally throughout, and thereby maintain an equality of thickness in the most important sounding part of the bell.

A properly cast bell would, under these circumstances, be exceedingly durable, because the whole circumference of the sound-bow must be deeply worn by the clapper before the bell would be seriously weakened and rendered incapable of sustaining the blows of the clapper without injury. A new bell is said to improve in its quality of tone after it has been hung and had a good ringing, the reason assigned is that the blows of the clapper condense the metal. Now this condensation can ordinarily take place in two points only of the sound-bow, therefore we may expect that when we are able to give the bell a good hammering all round with the clapper, the sound will be still further improved.

I have now described my alterations in the ordinary system of bell machinery, and explained the advantageous results which I consider them capable of producing, and which I believe they will be found to realize.

Although clocks and watches now abound, bells continue to be public favourites; they are still chimed to call us to church, and are rung on joyous occasions; new peals of bells are being constantly cast, and old peals recast with additional bells. No new Church is considered complete without bells, and much trouble has been taken and expense incurred in providing the Royal Exchange with bells and chimes. Thus bells are cheerful and harmonious adjuncts to our cities, towns, and villages. But the bell is also to be found at the dreary and secluded lighthouse station, where it is rung or tolled in foggy weather when the lights are no longer visible. A large bell is frequently fixed in such positions, and at the entrances of harbours. There is a very fine bell at Kingstown Harbour, connected with one of the lighthouses at its entrance, and Messrs. Mears have recently fixed one on the magnificent but dangerous rock, called the South Stack, at Holyhead; this bell weighs forty-two hundred weight, and with its gear and self-acting ringing apparatus forms an important addition to the machinery of the Trinity Company's lighthouse which stands on that rock. A bell so placed and used is a powerful agent in the preservation of human life.

While the value of bells is thus universally acknowledged, it is hoped that any invention, the object of which is to facilitate their use and increase their durability, will receive a favourable consideration.

The Chairman, Mr. Hussey, Fellow, invited remarks from any gentleman who might have paid attention to the subject of bells.

Mr. E. B. Denison, Q.C. Visitor, said that he had been a bell-ringer for many years, like a very famous member of his profession, Sir Matthew Hale. The only publications on bells which he knew of, merely touched the fringe of the subject; and, judging by the results, it seemed to him that the modern bell-founders knew less of their art than the old ones. It was well known that not one of the very large bells which had been cast in England within this century was considered equal to the Old Tom of Lincoln, or even to St. Paul's bell; and at the Royal Exchange not only one but two successive peals of bells had been condemned by the public ear, and they had now been again recast by another founder, although they had been approved by musical referees. But musicians did not necessarily know what bells ought to be, though they could of course tell if they were in tune with each other; but a set of cast-iron saucepans might be made in tune. He believed that architects might do something towards the improvement of bells, as they no doubt often had the management of them, if they would select bell-ringers in the neighbourhood to approve them before they were certified and paid for as perfect. He had been consulted by the Board of Works on the recommendation of Sir C. Barry, with reference to the bells for the great Westminster clock, which had been made from his designs; and it was proposed to have the bells, of which the largest would be 15 tons, cast under the superintendence of himself and the Rev. W. Taylor, who had paid great attention to this subject, and from whom he hoped they would hear something to-night. But the Board had now declined any further assistance from them, because they refused to have the Chief Commissioner of Works associated with them, knowing that his interference could not possibly be of any use, and might at any moment become obstructive. This was one more specimen of the way in which Government Boards did their work in small matters as well as in large. In answer to a question from Mr. Donaldson, Mr. Denison said that bell metal held a mean place between the speculum metal of telescopes, which was a saturated compound of copper and tin, and excessively hard, and gun metal; bell metal having about three of copper to one of tin, and gun metal having still less tin in it, The proper fusion of the metals so as to avoid *burning* the tin, was a matter of primary importance, and where it was not properly managed the bells would be porous and utterly bad, as some of the late Exchange bells were, though a few of them were as good as need be. He had long been struck with the want of uniformity, both in the hardness and the shape of bells, even in the same peal. Messrs. Warner of Cripplegate, the well known brass founders, had lately taken up the trade of making church bells, of which they had three in the Great Exhibition. Since then they had made some considerable improvements, and were able to avoid the *sand-cracks* which were a common defect. They had also made some experiments on different forms and thicknesses, at his request; and he was now satisfied from those experiments that bells, especially large ones, were generally made too thin in the *sound-bow*, and always too thick in the *waist*, for getting the best sound out of a given quantity of metal. He hoped soon to arrive also (if he had not done so already) at a definite result as to the best form or *sweep* for bells. Those approaching the flower-pot form were always bad, and so were generally those of which the height was much more than three-quarters of the diameter. Many of the Italian bells were of this long form, and he understood that they were almost invariably bad.

With regard to Mr. Baker's patent improvements in hanging, and in answer to a question from Mr. Papworth, Fellow, Mr. Denison said he had understood that the bells in one of the churches at Liverpool were hung on a cast-iron frame, but that it was not considered successful. Nevertheless he saw no reason why it should not be, if properly made. Bell frames were usually made on the most absurd principle, of what the bellfounders' carpenters call balancing the swings, which they fancied was to be done by making some ot the bells swing at right angles to the others—the position in which any counteraction was impossible, and the effect was that the bells were always trying to twist the frame to pieces. He had himself designed the frame for the large peal of bells cast by Messrs. Warner for the Cathedral at Fredericton in 1852, as to which he had been consulted by the Bishop. The carpenter violently objected to making the model which was to be sent out; but *his* plan was followed, and he had heard no complaints of its unsteadiness; on the contrary, the peal seemed to give great satisfaction in all respects. He need not tell the architects present that the bell-frame itself should not rest on or butt against the walls of the tower, but be laid on the floor, of which the main timbers should be braced together, either by strong floor boards or otherwise, so as to be as stiff as possible. In this way the bell-floor for Doncaster church had been designed by Mr. Gilbert Scott, the architect, and himself (he being one of the committee for re-building that church). He could not at all approve of Mr. Baker's plan of hanging a large bell by a single bolt through a hole in the crown, and would be sorry to stand under such a bell to ring it, as the strain was then six times what it was when stationary; even if the bolt itself stood, he thought it not at all unlikely to tear the crown out. The object of presenting a new part of the bell to the clapper might be obtained much better by casting the bell with a broad and low neck with a flanch all round it, instead of cannons, to which as many bolts as thought fit might be attached, going through the stock, and the clapper might be hung from a bolt through the crown and stock, fitting with a square into the latter, like Mr. Baker's plan in that respect, but quite unlike it in regard to carrying the weight of the bell. The toothed wheel and endless screw (even if the other part of the plan was unobjectionable) were quite out of the question on the ground of expense alone, and would not be the least more effectual than the plan he now proposed; the latter might take an hour to do, while Mr. Baker's bell might be turned to a new place for the clapper in a quarter of an hour; but inasmuch as a bell would certainly not require to be shifted above once in twenty years, that difference in time was not very material. He did not however at present see any objection to cast-iron stocks, except that they would be heavier and dearer than wooden ones; and there was no material shrinkage in the latter after a few years, especially if painted or otherwise prepared. He thought it was a mistake using elm instead of oak for them. Cast-iron wheels he thought quite an unnecessary expense; and the lighter the wheel the better, because the less momentum it had. He agreed with Mr. Baker that the *sliders* were very commonly made so as to occasion unnecessary friction in ringing. But he had himself altered the sliders of a peal of bells which he used to ring above twenty years ago, by making them run in circular grooves struck from the gudgeons of the bell, and this produced just the same effect as Mr. Baker's more complicated plan, and if a slider was broken by a young ringer, it only used to cost sixpence to put in a new one, as they need only be sticks, and not pieces of carpentry, when made to run lightly.

Mr. Papworth, Fellow, called attention to the cross-bracing of the iron bell-frame shown in the model, and asked how it was intended to be applied to a number of bells in one frame. He also alluded to the question whether the clock should be placed above or below the bells to escape the effects of vibration.

Mr. Denison would answer the latter question in a moment. Where there was a large peal of bells, the tower was almost certain to vibrate when they are rung; and in that case the lower the clock can be put the better, for a steady support was essential to its accurate performance.

Mr. Baker defended his proposed method of hanging bells. The central bolt might be made strong enough to resist any strain thrown on it, by taking the precaution of using the best materials. After a long spell of ringing a ringer would be convinced of the advantage of his proposed method, as the gudgeons remaining true and the stock not warping, there would be no extra friction to cause extra labour. The wheel of a 30 cwt. bell would be 8 feet in diameter, and might be hauled up to the bell chamber through the louvre windows. The center to receive the gudgeon would be turned out to shape, the rest of the wheel would be an ordinary casting in iron. He did not think that any cross bracing in the lower horizontal parts of the cage, as mentioned by Mr. Papworth, would have any effect in regard to the lateral thrust on the tower.

Mr. Ashpitel, Fellow, had paid much attention to bells on the Continent, especially in Italy, where they are generally much taller and tumble in more at the top than in this country. A long lever projected at right angles from the stock, to which a rope was attached for ringing them, though they were rather chimed than rung, as they were raised but little in the operation. A good specimen might be seen in the leaning tower at Pisa. The cannons on the crown were higher than in English bells, the opinion in that country being that the more independent the bell was of the stock the better the tone. If this was the case, it would be better to suspend the bell from one long boss, than from several straps screwed up to the stock. At Rome he had observed that the clapper was so hung as to have some play round the sound bow, and not to strike always on the same point. The extra thickness usually given to the sound bow might have been a provision to allow for chipping away the metal in the old method of bringing them to the proper tone—[Mr. Denison, No.]—but this operation was now accomplished by turning them with a lathe. Mr. Ashpitel's practice in hanging bells was to fix strong stone corbels in the walls of the tower, on these corbels he placed the main girders quite free of the wall, with a space of one inch or more allowance for play, on them the floor, and on the floor the bell frame or cage, but not fixed to it, so that each of these parts might move independently of the others. The theory of vibration, that a bell struck became changed from a circular to an oval shape in producing a musical sound, might, he considered, apply also to the tower. He would therefore advise that the tower should be constructed to allow for this change of form; let it be built solid in itself, an homogeneous mass of wall all round, but without any cross bracing or strutting to resist the vibration. There might be some difficulty in getting an iron wheel into belfries, but the ordinary wooden ones were easily taken up in pieces. He had some hesitation in trusting to cast iron for the stock and gudgeons, having seen instances of the sudden manner in which failure took place in that material. As an instance of a tall-shaped bell, he would mention the great bell at Canterbury, which was known to travel well.

Mr. Baker explained that the gudgeons in his method were of wrought metal, inserted and secured to the cast iron stock.

Mr. C. H. Smith, Visitor, believed that all bells must, from their crystalline nature, sooner or later become cracked, even though they might last 500 years before the failure took place. He would submit as an interesting problem—find the best shape to produce, from a given quantity of material, the best sound without liability to fracture. He would advocate striking the bell quietly in preference to swinging it to produce tone. Harmonious sounds might be produced even from lumps of metal, or rock, nowise fashioned to a bell shape.

The Rev. Wm. Taylor, Visitor, agreed with Mr. Smith that the best shape for bells was not yet known. Even lead cast in circular shape would yield a sound. But he could not agree as to striking bells quietly, for they always sound better when swinging than when struck without moving. Much difficulty attended the mathematical investigation of the subject. So many data were required—but there were many rules which came practically near to the truth. In the composition of the metal, great care was required that it should not be overheated, as, in that case, the tin would be driven off. He had seen many of the large bells on the continent. That at Erfurth measured about 11 feet diameter inside, weighed fifteen tons, and required twenty-eight men to ring it, who, by means of two wheels and cables, were enabed fairly to *set it*. The bell at York Minster weighed only ten tons,* but thirty-four men had in vain tried to *set it*. At Erfurth, the stock was quite straight on the underside. At York, as in England generally in large bells, the crown of the bell was let into the stock; this might have some influence in causing the difficulty of raising it. At Pisa, a heavy mass of metal was laid on the stock to give momentum when the bell was moved by the direct application of a person working the lever. Considering the centrifugal force in ringing, he should hesitate to trust a large and heavy bell to a single screw, as proposed by Mr. Baker.

Mr. **Baker** explained, that by letting the crown of the bell into the underside of the stock the centre of gravity was raised, and the oscillations were made quicker to correspond with those of the smaller bells. But Mr. **Denison** showed from the model that the effect of thus sinking the bell into the stock, not only weakened the stock, but made the clapper *rise false*, *i. e.*, on the down-side instead of the up-side of the bell, because the axis of the clapper was then no longer below the axis on which the bell was swinging. He had no doubt, with Mr. Taylor, that this was the reason of the impossibility of raising the York bell, and believed that mode of hanging to be wrong; the diminution of the time of oscillation suggested by Mr. Baker, was quite inappreciable, as would be seen by any one conversant with the theory of pendulums.

On the motion of Mr. **Donaldson**, H.S.F.C., thanks were voted to Mr. Baker for his paper, and to the gentlemen who had favoured the Meeting with further explanation of the subject, and the Members adjourned to the 19th instant.

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* Mr. Baker, under date March 17, 1855, forwarded the following communication:—" The great Bell at York is furnished with two wheels, and two ropes to each wheel; it weighs 10 tons 15 cwt., and is considerably the largest bell in this country, being 7 cwt. more than twice the weight of the great bell of St. Paul's in London."

Messrs. Mears of Whitechapel, also wrote that " the great Bell at York Minster was completely raised and fairly rung by *sixteen men* on the 21st of August, 1845. There were four ropes, and four men to each rope.."

ON THE PRINCIPLES TO BE OBSERVED IN DESIGNING MEDIÆVAL DECORATIONS AND ORNAMENTS, WITH REFERENCE TO THE SOURCES OF ORNAMENT OFFERED BY THE NATURAL KINGDOM.

By W. P. Griffith, Fellow.

Being Extracts from the Essay for which the Medal of the Institute was awarded 1855.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, March 19th, 1855.

As in the natural kingdom certain principles are found regulating the most minute growth, and the largest forest tree, so in architecture there are principles common to all its productions. In the mediæval period, for example, those contained in the multiples of the equilateral triangle, the square, the pentagon, and the circle, guided the formation of decorations and ornaments in gold, silver, brass, iron, stone, wood, and even the designs upon encaustic tile pavements, as well as the construction of the cathedral or church itself. This system of regulating form by geometrical figures was carried to a remarkable extent; in the services of the church, the candlestick, the lamp, the lamp-stand, the *corona lucis,* the vessel for incense, the censer, the chalice, the flagon, and even the vestments were designed with the aid of geometry.*

The ornamentation of our earliest sacred edifices was not altogether derived from foreign countries, and what was introduced received certain modifications. Through the diligence of antiquaries, a collection of Roman, Saxon, and Norman remains has been of late years amassed, from an examination of which, a system of decoration, floral and otherwise, can be traced, which may have exercised its influence on mediæval architecture; and it is admitted by all who have devoted their attention to the details of that architecture in this country, that they are less Italianised than those on the continent, and that they possess an indigenous character.

So extensive is the range of art decoration in every civilised country, each of which possesses its own characteristic development, that it would occupy a lifetime to collect, analyze, and study comprehensively, the resources of so widely cultivated a field. It has often been urged that we must look to nature as a source for ornamentation, but when she has been sought, the student has not known what course to follow, nor how to proceed in a natural conventional manner. The difficulties which encompass attempts to design modern ornaments are often referred to; one writer says, "As a general rule, the less closely the artist attempts to embody nature, the more safe he will be," and another writer observes that "it is extremely difficult to lay down any rule to say how far nature should be followed, or how far she should not." The difficulties, however, are not so great as they are supposed to be, when a little trouble is taken to comprehend the rules for embodying nature in decorations and ornaments. So many unmeaning designs having been thrust upon the public by those who have not entered deeply into the subject, have created a prejudice against modern performances; and it has therefore been considered "safer" to copy from those sanctioned by antiquity, than to produce new ones. Although it is true that modern designs have to be judged by posterity, to be worthy of lasting approbation; yet, unless efforts are made to create new ornaments no progress can be anticipated.

One of the objects of this essay is to point out the best way of obtaining plants and rendering them available for the purposes of design; and another is to guide the student in his attempts to produce ornaments in relief, more or less detached, and ornamental surfaces. Though

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* See A. W. Pugin's Glossary of Ecclesiastical Ornament.

he need not seek to equal Lindley, Hooker, or Balfour, he should know enough of botany to be acquainted with the plants and foliage he selects for adaptation. "The scientific botanist recommends his pupil to provide himself with a pocket lens of about half an inch focus, and a few quires of paper; the former to assist him in examining, and the latter in drying the fresh specimens he may collect." The architect, however, requires a greater knowledge of *living* plants than of *dead* ones; leaves and flowers, after they have been flattened, are of little use, as the undulations and the beauty of the forms are lost. Lindley says, "the apparently flat surfaces of leaves and petals are only segments of large circles. This is a necessary consequence of the primitive spheroidal form of vegetable tissue, which, in whatever way it may develop itself, must always be bounded externally by the curved sides of the parenchyma." The form of the leaf, the disposition and projection of the veins, the position of the leaves upon the stem, the form and character of the stem, the flowers, and the fruit, are all of moment, and require to be carefully studied. It is also important that the name of each plant selected, for a capital for instance, should be given; that of the order will not suffice, because the leaves vary in form; and although the leaves of one plant may be well adapted, those of another belonging to the same order may be entirely unsuited to the purpose.

The plants collected should be kept in a tin case until they have been accurately copied whilst they are fresh, as the forms of their several parts disappear when they are dried. The principles to be followed in imitating nature are those which she herself adopts in the organization or arrangement of her works; no abortions, imperfections, or peculiarities ought to be copied, but the architect's object should be "to make things not as nature makes them, but as she would make them." Perfect foliage, flowers, and vegetable forms copied in decoration, must be distributed and applied in strict accordance with Nature's rules. For example, if we have a square panel or space, and desire to decorate it with the leaves and fruit of the oak,—to take a branch from the tree and lay it upon the panel, would produce an exact imitation of nature, but would show no design, nor geometrical distribution; if, however, the branch be geometrically disposed, *i. e.* the leaves placed upon the diagonal, and the fruit upon the diametric lines,—the leaves and fruit would be *per se* exact imitations, as they sometimes should be, although the design or arrangement of them in the panel would be conventional.

In Grecian and Roman decorations, the foliage, fruit and flowers were varied according to their use and position in the buildings. The panels at the side of the entrance in the exterior of the Pantheon at Rome; the frieze round the exterior of the Temple of Vesta at Tivoli; St. Paul's Cathedral, and the upper entablature of the Banquetting House at Whitehall, offer examples of excellent imitations of foliage, fruit and flowers, arranged in festoons or garlands, with ribands round their stems and stalks. This classic system differs considerably from the mediæval one; in the former, the festoons or garlands are heterogeneously mixed and stuck on the buildings or sculptured purposely to appear so; and sometimes the ribands are suspended from nails; but in the latter, the foliage and fruit grow out of the stonework with all the regularity of nature, whom the architects endeavoured to imitate truthfully,—the leaves and fruit of the maple, ivy, vine, oak, strawberry, and many others, being exactly copied, and arranged upon natural or geometrical principles.

In the best periods of architecture, design or mental arrangement upon natural principles was universal, but in modern times it is mostly dictated by caprice, fancy, and chance, except in those instances in which the decorations have been copied from the antique; the best examples of which will always be esteemed, because their forms have been derived from nature.

In mediæval ecclesiastical architecture, the treatment of ornaments remote from the eye, and not easily inspected, varied from that laid down by Sir William Chambers for Roman ornaments seen at a distance, inasmuch as the former were generally finished with the utmost elegance and minuteness, even in the portions concealed from view; this perfection has been supposed to have arisen from the impression that the whole carving and execution were an act of adoration, in which the artist offered up his best faculties to the praise of the Creator. Such decorations are more beautiful than the garlands, festoons, and similar ornamentations of Roman architecture, inasmuch as they are not merely taken from nature, but are disposed in conformity with the laws of vegetation. The petrified vegetation in the choicest examples of our ancient Gothic churches appears to grow out of the buildings, and not to be plucked from the garden or hedge, and stuck on, as in some English and in many foreign instances. The stem either flows out of the cornices, capitals, and traceries, or is hidden by foliage; the end of the stem broken off from the tree or plant is not visible. Crockets have a better effect when they are connected by and are set upon a continuous stem, as in the lower part of the pediment of the great west door of York cathedral, and not as on the south transept of Beauvais Cathedral, where they do not appear to grow out of the stone.

"The ornamentist," says Mr. Dyce, "is an imitator of nature in a sense very analogous to that in which the man of science may be termed so, who applies her operating and governing laws and the means and hints furnished by her to the accomplishment of new ends of convenience and utility; and the real position, accordingly, of ornamental design is side by side with practical science: its real use being to hide, by a coating of beauty, the skeleton-like contrivances of the latter, and thus to bring them into the condition of the works of nature, in which beauty and utility are always concomitant."

In the ornamentation of sacred edifices, it would be well to consider the system which prevailed in the decorations of the first churches which the Christians were allowed to build above ground. St. Jerome tells us that the priest Nepotian decorated the interior of his churches with flowers, foliage, lilies, and the gay branches of the vine. When pictures were attempted upon the walls or cupolas, the subjects were taken from holy writ, and the painters had the same source of inspiration as the artists who decorated the catacombs of Rome; and that source was the Bible. We are told that these catacombs, destined to the sepulture of the first Christians, and decorated during the persecutions of the Church under the immediate dominion of sad thoughts and agonizing duties, offer representations of heroism in the historical pictures, and graceful and cheering subjects in the purely ornamental parts, as the vintage, pastoral scenes, agapes or love feasts, fruits, flowers, palm-branches, laurel crowns, lambs, and doves; in a word, nothing but what suggests a feeling of joyous innocence.

In the Middle Ages, the monks rendered their abbey gardens attractive by flowers; they reared an appropriate one for each holy day; flowers thus became subservient to sacred uses, and useful in imparting instructive and pious lessons to the young. The study of ecclesiastical botany was revived and considerably advanced; herbs and flowers received a special nomenclature; medical botany was also much improved, and the plants named by the classic authors were consulted and compared with native specimens. Flowers were also dedicated to saints, and in honour of the Virgin Mary. In early times, each day had its flower of a particular colour, and the common events of life were marked by floral decorations; the funeral had its cypress and rosemary, and graves, crosses, and tombs were decked with suitable trees and flowers. Altars also at certain times were set out with floral symbols. The idea of perpetuating in stone the beauties of the vegetable kingdom, emblematically expressed, was a happy one of the greatest antiquity, and there is no style of architecture without its flora, more or less conventionalised.

In ecclesiastical decorations only such trees, plants, foliage, flowers and fruit are to be selected as symbolize Holy Writ. The Holy Eucharist, the Holy Trinity, the Crucifixion, may be symbolically expressed by vegetable products, either naturally, or by a geometrical arrangement, termed by some writers conventional. Those which do not naturally express by their form symbols, are to be when selected so arranged upon geometrical figures, as to form religious emblems. A church ought to be decorated with the greatest care and skill, to present a wonder-work of art, and from the natural and artistic beauty of its decorations vie with nature herself; with Pliny, we ought to be able to exclaim "Hic in unum coacta rerum naturæ majestas;" here we see Nature in all her majesty developed within a narrow compass.

The ornaments for the several parts, the tower, the nave and ailes, the transepts, the choir, the chancel and its ailes, should be different both in degree and style. Of flowers, possessing a sacred symbolism, the Ecclesiological Society mention—the lily, the rose, and the marygold, (all symbols of our Lady); the herb Benet, (symbol of St. Benedict); the ivy, (of immortality); grapes and wheat-ears, (of the Holy Eucharist); the oak, (of virtue and majesty). The Holy Trinity is symbolised by trefoils, and ternate, bi-ternate, and tri-ternate leaves. The natural symbols of the Crucifixion, are the passion-flower (passiflora), and flowers of the cruciferæ order, with sepals 4 cruciate, petals 4 cruciate, alternate with the sepals.

Schlegel has observed in an essay on Gothic Architecture (translated by Millington), that in the "second-floriated Gothic style (decorated), the same figures of the triangle and the square, the circle and the quatrefoil, form the groundwork of all those (floral) decorations, which, as in the early Christian, are introduced with a more profound attention to the scientific structure of the building. But these no longer appear in naked simplicity and geometrical exactness; they are all veiled with clustering foliage and the luxuriance of vegetable life: as in the enamelled carpet of spring, we cannot, amid its verdant productions, clearly discern the precise geometrical symmetry of each isolated form, but see all bloom and unfold their beauty together, in one general glow of life and immortality! The very existence of Gothic architecture seems bound up with the luxuriance of its forms and floriation. Hence the unvaried repetition of the same decorations, their plant-like similarity, and the deeply expressive yet tranquil mystery, the joyous loveliness and animation, which fill every beholder with reverence and admiration. The symbolism of Gothic architecture is, indeed, of the highest order; that of painting appears feeble in comparison with it, and its allusions to divinity embarrassed and uncertain. Architecture, on the contrary, by its imitation of the beauties of nature, brings the idea of the Divinity palpably before our minds, even without any direct allusion to the mysteries of Christianity. Christian faith and hope had, however, no trifling influence on the development of ecclesiastical architecture." Coleridge says that a Gothic church "is the petrifaction of our religion." The rose and trefoil, in various combinations, may be recognised as the basis of all the highly artistic foliation with which the cathedral at Cologne is adorned. In foliated forms, the cross is made strikingly manifest, by selecting cruciferous plants, or by arranging leaves in the form of a cross.

It is believed by all who have given attention to the subject of natural ornamentation, that leaves, flowers, and fruit, when selected for decorations, are conventionalised; and it is quite true, that the early architects, when they sought nature for ornament, did dispose them in a geometrical manner; they did not place vegetable products upon walls, columns, bosses, &c. in an undesigned way, but they had a system upon which their proceedings were grounded. It would be futile to endeavour to secure greater beauty and precision in decoration, without inquiring into those laws which directed the formation of those interesting and often beautiful natural designs of the early architects; and the nature and extent of conventionalism should be carefully analyzed, and separated from the mis-shapen aboriginal examples, in which the early sculptor endeavoured to imitate nature clumsily and imperfectly, but did arrange vegetable products conventionally. The ignorant imitation of nature must not be confounded with the conventional or geometrical disposition: on comparing Anglo-Roman, Danish, Saxon, Norman, Early English, Decorated, and Perpendicular, sculptured or carved foliage, flowers, and fruit, we shall find that all are more or less conventionalised; but nature in the earlier periods is hardly known as such, through the sculptor's want of imitative skill. When foliage, flowers, or fruit, are selected for decorative purposes, they should not be portraits of any single specimen taken from a garden or hedge, but they should be ideal; in fact, more perfect than nature forms any one leaf or flower, so as to realise the remark, "art is nature, better understood."

Mediæval Decorations and Ornaments may be considered under two classes:—1. Ornaments in bold relief, more or less detached,—these include capitals, corbels, bosses, crockets, finials, pateræ, dog-tooth, ball-flower, nutmeg ornament, Tudor-flower, roses, poppy-heads, fleur-de-lys, &c.;—and 2. Mural or Surface Ornaments;—these comprise panels, spandrils, diapers, encaustic tiles, &c. The following extracts relate to the designing some of the ornaments, but the Essay itself, in which each is historically described and analytically treated, must be consulted for many of them, which are illustrated by numerous diagrams.

The capitals of columns generally give a clew to the date of a building. They vary in size, form and decoration, and are either moulded or foliated. The bell should be carefully proportioned and curved; otherwise, though ever so well decorated, it will be a deformity. Norman capitals are often degenerated imitations of Roman work. Early English capitals and ornaments have sometimes trefoil leaves introduced, variously combined, and are boldly executed and enriched in an elaborate and elegant manner. Good examples are seen in Salisbury and Wells Cathedrals. "The origin of foliage" says Paley, "on capitals, whence it was transferred to bosses, corbels, window and doorway-arches and jambs, and other positions, may be distinctly traced through the Romanesque to the Classic, and especially the Corinthian style," and the idea of the latter was borrowed from the Egyptians. The foliage upon the capital of a mediæval column judiciously rises above the neck-moulding, so that the latter does not prevent its being seen. When the foliage rises from or is in contact with the neck moulding, the projection of the latter foreshortens the capital, and gives it an inelegant appearance. Some Mediæval capitals have heads and figures sculptured upon them, but they should not be imitated.

For the dates of buildings, Mr. Repton * relies more upon the ornaments and details, than the form of the arches only, but if, as he states, many capitals in different buildings are old ones *recarved* and made to correspond in some degree with new parts or additions, great attention and care should be given in examining architectural details before an opinion is pronounced. In Bingham Priory, Norfolk, erected in the reign of Henry I. a building was added at the west end in the time of John or Henry III. in a different style of architecture, and with round capitals, but, to blend the old massive part of the priory with the new building, some of the old square capitals were recarved, and the abacus rounded off.

Norman and Lombardic capitals are variously ornamented, and exhibit a great variety of designs, which owe their origin primarily to degenerate imitations of the Tuscan, Doric, Ionic, Corinthian and Composite capitals of the Roman orders; the results of these attempts have produced numerous very curious decorations, but of no architectaral value or importance. The crypt of Rochester Cathedral contains Norman capitals; each has a square abacus, 2 feet square, and 4½ inches in depth, and beneath it an ovolo and an astragal or bead, — it resembles the capital of the Tuscan order. The piers opposite to these columns have each a similar abacus, with a channel beneath it ⅝ths of an inch deep and then a cavetto 2 inches deep. This is often used as a string course. The next kind of capital, which is common, is a modifiation of the Doric. It has a chamfered fillet on the top, and the original broad flat abacus and ovolo are united, the angles being rounded off form an escalop edge, and under the whole is a bead. Some writers describe the form of this capital as an inverted cone, cut to present four flat sides, or faces. By channeling the conical mass, a series of escalops are formed, and the spaces below them are will be satisfied that the world is not to be condemned for prejudice because we do not discard our bells, and content ourselves with hanging up the clappers alone and striking *them.* Here is one more experiment for saving a great part of the weight of a bell. My colleague in the matter of the Westminster bells, Mr. Taylor, has brought here a small bell with the greatest part of the waist cut away as you see; so that the bell now consists of little more than a widish ring hung by some strips of metal to the crown. The note is thereby made deeper, for an obvious reason which I shall notice hereafter; but I am perfectly satisfied that the bell is spoilt, though unfortunately I cannot satisfy you of it just now, because we have not a fellow to it here uncut.

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* Archæologia, vol. xxxiii. page 140.

Now from these and other experiments I have come to the conclusion that bells of the common and well-known shape, with a thick lip or sound-bow, are the most effective known instruments for producing a loud and musical sound, such as you want when you erect a large public clock, or put up a peal of church bells. And I confess also that after trying at Messrs. Warners' a number of experiments with bells of the usual *general* form, but with various deviations in the details, I am equally satisfied that there is nothing to be gained by deviating materially from the established proportions of the best old bells. And I think it is some confirmation of my views to tell you that Professor Wheatstone having been commissioned by the Board of Works, with Sir C. Barry, on his own suggestion, to collect information at the late Paris Exhibition "respecting the most esteemed chimes in France and Belgium, and whether there are in those countries makers acquainted with the traditions of the art, or who have applied the discoveries of science to the improvement of bells, *or to efficient substitutes for them,*" has come back with the conclusion that no such efficient substitutes have been discovered, nor is there any known improvement on the established mode and materials for casting them. Sir C. Barry and he indeed seem to have been rather impressed with the merits of the cast steel bells which you may have seen noticed in the newspapers. I have not heard them myself, but I have heard such decided condemnation of their harshness of sound from other persons of probably more experience in such matters, that I do not the least believe in their being received generally as an efficient (though they may be a cheap) substitute for the more expensive compound of copper and tin: and, on the whole, that seems to be Professor Wheatstone's opinion also.

But although I have thus satisfied myself that the common form and material of large church and clock bells, such as we want at Westminster, are substantially the right ones, there still remains a great deal to do to ascertain the more precise details of form and composition which will produce the best sound out of a given quantity of metal. And here I considered that we had to begin at the beginning, and it is hardly an exaggeration to say, that instead of presuming that anything is right because we now find it in use among the bell-founders, it is rather safer to presume that it is wrong. That there is something very far wrong somewhere in the modern style of casting bells, and especially large bells, is manifest from this—that everybody who has paid any attention to the subject, complains of the lamentable inferiority of modern bells to old ones, and even to bells made in the early part of this century. Let me quote again that same letter of Prof. Wheatstone's to the Board of Works, with reference to this subject:—"The very unsatisfactory result of the chimes constructed for the Royal Exchange, which have been twice re-cast, without any ultimate advantage, shews that no known bell-founder in England can be relied on." And then he makes the suggestion which I quoted just now. I know perfectly well that the makers of all these three unsuccessful peals of large bells (two of which were cast by Mr. Mears, and the third by Messrs. Taylor, of Loughborough), can produce volumes of testimonials to the excellence of their bells. But I have seen rather too much of testimonials to pay much regard to them, whether they relate to bells, clocks, or morals. To say nothing for the present about the two latter articles, I have heard people describe bells as "very fine," which

I would not buy at a penny a pound, except for the purpose of selling again at ninepence. As for the opinion of musicians, as such, I value it rather less than that of other people, because I have always found that the first and almost the only thing they look at, is whether a peal of bells are in tune with each other, the least important part of the business for two reasons; first, because if they are out of tune (unless very atrociously), they can be cut into tune; and secondly, because a set of iron saucepans could be made as perfectly in tune as the finest peal of bells. And with regard to single bells, where the question of tune does not arise, still, unless a man knows by experience what kind of sound a certain weight of bell metal ought to produce, it is impossible that his judgment can be worth anything on the merits of any particular bell. Most Oxford men believe their Great Tom is a very fine bell, just because it makes a loudish noise, and they have no idea, and cannot have any, whether it is either the quantity or quality of noise which ought to come out of a bell of 7½ tons. Whereas, I know that a *good* bell of half that weight would give a much louder and a much pleasanter sound, and that in fact, the bell is about as bad as possible. I mention that because it is not a modern one, having been cast in 1680; and because the *occasional* occurrence of bad old bells, and also of good modern ones, proves that the general badness of the modern ones, compared with the general goodness of the old ones, is not to be accounted for by the hypothesis that they improve by age; though it is true, that they generally do improve a little for a few years. Without saying that any of the modern large bells, such as those of York, Lincoln, and Montreal, are quite as bad as the Oxford bell, they are all very far short of what they ought to be, and very inferior to the *old* Tom of Lincoln, which was cast in 1610, and was considered the finest large bell in England, as I can easily believe from the density of the metal, of which I have a piece, and I shall say more about it presently.

It has been stated in substance by the founders of the two first condemned Exchange peals, that the second of them at any rate must have been good ones, because they (or most of them) were cast from the same *sweeps* or patterns as the celebrated Bow bells, which were cast by the predecessors of the same firm in the last century; and indeed they say the same of many others of the modern peals which people are stupid enough to pronounce very bad. I am rather inclined to think, that this identity of shape, together with the inferiority of sound which is manifest to everybody except the founders, proves something very different, viz., that they have forgotten the traditions of their own art and of their own house; and as the quality of bells cannot possibly depend on more than these three things—shape, metal, and casting, and they themselves tell us that the shape is the same, they leave us no other solution, except that they use bad metal, or have lost the art of casting it properly, or both. That some of the modern bells are unsoundly cast, I can say positively, because I have seen the metal full of holes, which are sometimes visible on the surface, but sometimes, and I suspect more frequently, invisible until the bell is broken. The larger a bell is, the more likely this is to happen, as it is well known that thick castings are harder to make sound than thin ones; and that is an obvious explanation of the fact, that the large bells of modern times are even worse than the small ones. Now it luckily happens, that we have a ready means of discovering whether a bell is both soundly cast and of good metal, by simply taking its specific gravity for the soundness, and analysing a piece of it for the purity. You may file off enough from any bell to enable a chemist to analyse it, and see whether it contains any baser (*i. e.* cheaper) metals than copper and tin. And we know what the specific gravity ought to be: the old Lincoln bell was 8·78, and the old Doncaster bells (of 1722, not 1835, for some of the latter I know were unsound) were 8·76: the French authorities on the subject, I find, put it as high as 8·82, and from actual experiment. It is remarkable, that there is scarcely any difference between the specific gravity of the alloy, whether it contains the largest or the smallest proportions of tin to copper that are ever used; because, though the tin is to insert in the triangular space either vertical foiled panels, a circle quatrefoiled, or a square modified for a shield or a portcullis. It was an easy and save-trouble system to fill up a spandril with a foiled circle, and then to foil and foliate the spaces remaining; but to group foliage, flowers, and fruit, was neither an easy nor an economical process. When plants were selected, the geometrical rule for arranging them was the same, although the result was different. The stem, if its root was not hidden by the leaves, germinated from one of the angles, and was coiled in a circular form, sending out shoots to the intermediate angle, and to fill vacant spaces, and it then assumed a flowing line to the extreme acute angle. The end of a stem, as if broken off, should not be introduced. The Mediæval architects did sometimes represent foliage with such stems in crockets as well as in spandrils, but these examples should be avoided, as it is much better for the branch to grow out of the building than to appear to be stuck on. Foliage flowing from the mouths of animals, or from an unnatural extension of the tail, should not be imitated. Sometimes the latter assumes beautiful curved forms and foliage; it would, however, be as ornamental and less absurd if the animal was omitted.

In Pugin's Gothic Ornaments, plate 37, shows two spandrils from Winchester Cathedral; in one example the stem grows out of the lower angle; and in the other (which consists of oak-leaves and acorns), the end of the stem is hidden beneath one of the leaves. Although the stems are correct, an unnatural growth is given to one oak-leaf, which is distorted in length to fill the space.

The sculptured representation of flowers, applied to relieve the plain surfaces of walls, is termed diapering. In selecting flowers for this purpose, care must be taken to choose only those forms which are suited to the geometrical spaces allotted to them. For example, a flower with petals rounded at the apex is not well adapted for a figure with acute angles; the more obtuse the angle the better will a flower with rounded petals fill the space, and *vice versâ.* Upon a monument in the choir of Canterbury Cathedral there is a diaper, the design of which consists of a flower with six petals, slightly raised in relief within a hexagonal compartment; the flower has petals well suited to the angles of the figure. For square forms cruciferous flowers are chosen, as in the nave and choir, and on the tomb of Aylmer de Valence, in Westminster Abbey. If the spaces be triangular, or hexagonal, flowers having a ternary division of parts are the best. For octagonal compartments, those having a cruciferous division should be chosen; and for filling pentagons and decagons, those with a quinary division of parts. In this work, the leaves and fruit of the oak are met with; as on the choir screen of Lincoln Cathedral, and the cornice of the Queen's Cross, Northampton.

Diapers were more frequently produced by colour than by sculpture in relief; in the absence of historical paintings upon walls, the large surfaces were generally diapered. They were of several kinds; that commonly met with extends as a running pattern, often executed in a deeper shade of the ground colour. There is a variety of this which may be termed, with more propriety, arabesque; it is seen in the groined canopy over the tomb of Aveline, Countess of Lancaster;* and consists of an entwining pattern of vine leaves and fruit, the fruit and stems red, the leaves green; the ground straw colour, perhaps originally gilded. A second form, perhaps better understood by the term powdering, has a profusion of small sprigs or flowers, generally black or gold, scattered over the ground. The diaper of a wall sometimes consists of nothing more than the founder's initials, the monogram I. H. S. and like devices, in red, geometrically arranged upon an uncoloured ground, that is a ground which has no other colour than the prevailing tint of the building. The use of diaper is to supply the place of middle tints, the introduction of which destroys the brilliancy, and interferes with the keeping of polychromatic painting; a mass of colour of whatever weight or prominence may be enriched, and at the same time toned, to almost any limit, by a judicious use of diaper.

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* In Westminster Abbey.

The sides of the font in Swaton Church, Lincolnshire, are diapered, the flowers are cruciferous, and the form of the petals accords with the square outline of each diaper. The date of the font is *circa* 1340. The sides of the font in Ewerby Church, Lincolnshire, are also diapered.

Great care and judgment are required in selecting vegetable productions for ecclesiastical decorations and ornaments; many plants are available for this purpose, and very many are not. Something more is required than a simple trefoil, quatrefoil, cinquefoil, &c.; it is absolutely necessary that each leaf selected be suited to the space allotted to it; to twist or distort a leaf in an unnatural manner is not required. An error of this kind occurs in Bloxam's Gothic Architecture, in a modification of the dog-tooth ornament (from Adderbury church, Oxfordshire), converted into a knot of four ivy leaves; it will be observed, that in each leaf the side ribs branch from a midrib, instead of which the ribs ought to radiate from the stem, palm-like, as in the ivy leaf. Nature must not be misrepresented.

Among other plants adapted for art-purposes, we may suggest the following:—Trifolium fragiferum; trifolium subterraneum; medicago polymorpha; fragaria sterilis; rubus; limonia trifoliata; iatropha gossypifolia; panax aculeatum; solanum fuscatum; cynanclum extensum; geranium robertianum; citrullus or auguria; chelidonium majus; adoxa moschatellina; alchemilla; gronovia scandens; atriplex; sorbus torminalis; sorbus sativa; amygdalus; cataputia minor, and lathyris; androsæmum; berberis oxyacantha; viola canina; tragopogon porrifolius; and many others. All these may be seen in Curtis' Flora Londinensis.

In addition to the diagrams accompanying the Essay, there are forty-two drawings arranged in four divisions. In the first division, twenty-four illustrations exhibit an analysis of mediæval ornamentation and prove that, however diversified in appearance Gothic ornaments may be on the buildings, they are quite as capable of being classified and reduced to system as the ornaments common to any other style of architecture. It will be observed that ornaments are not required to be always symmetrical; their parts must, however, be properly balanced; the quantity of sculptured ornament in each half should be equal. The conclusions to be drawn from an examination of these twenty-four illustrations are—

That mediæval ornaments are designed in conformity with geometrical figures, and are capable and worthy of analysis.—That the great variety of forms does not militate against an analysis being attempted.—That the decorative portions need not be limited to the foliage and flowers selected by our ancestors, but that any others adapted to the geometrical spaces, and properly conventionalised, can be employed.—That geometry is the basis of all true ornament.

In the second division, six designs for double pateræ in decorated cornices are submitted. The foliage is directed by the diagonals of two attached squares, and has been chosen from the vine, wheat, the oak, the Guelder rose, the ivy, the maple, and the lily of the valley. These double pateræ are designed upon the same principles as the ancient mediæval ones; they are set at certain distances apart, as the single pateræ.

When a child is first instructed in writing, diagonal lines are ruled by the tutor to guide his hand, but after a time when the eye and hand have received the proper amount of practice, the lines are no longer required. With the sculptor or artist it is the same; his eye guides his hand in properly proportioning the several parts of each ornament; the course of the stems, leaves, flowers, &c., whether they be curved in a horizontal, perpendicular, or a diagonal direction, are all freely executed by his practised hand, although in the first instance all the geometrical rules had to be demonstrated for his initiation.

In the next series of designs for mediæval ornaments, the following vegetable products have been used, viz.—the water buttercup (for the panel of a font); the ivy-geranium; the plane tree; the rose; the myrtle; the crowfoot; the wood anemone; and the liverwort. A new feature is exhibited by working bosses out of the regular bodies. If we select the dodecahedron, the first process will be to produce a pendant hemi-sphere, and then to mark the angles or points for the six equal pentagonal faces (as only half of the regular figures is presented to view); each rose is then wrought out of the space thus allotted; the surface should not be *flat*, but in *spherical relief*, or convex. The central space contains a rose with two rings of petals, and the other flowers are single petaled. The half-faces of the pentagons adjacent to the ribs of the groining are to be filled with two or three rose leaves. The roses are conventionalised; the stamens not individualised, but roughed out *en masse*. Another boss is generated by the icosahedron. Bosses executed in this manner form "knots of reposing flowers."

The fourth series of designs shows enriched cornices; the plants selected are the dog-rose, the white bryony, and the large white bindweed. The stems of these plants are bent to form flowing or wavy lines, which can be produced by uniting a continued series of alternating semi-circles. When the eye has been educated for, and the hand accustomed to, this kind of ornamental work, the design can be marked without mechanical means, which are only required in tuition. The pistils and stamens of the flowers are not to be separately sculptured or individualised, but they are to be roughly worked *en masse*.

In conclusion, it will be found that there are principles conveyed to us through the natural kingdom, which man has endeavoured to apply to all he undertakes, and certain it is that in architecture and its concomitant arts, he has followed the working of nature to a great extent;

> "That Art
> Which you say adds to Nature, is an Art
> That Nature makes."
>
> Winter's Tale.

The architect is indebted to nature for geometry, which is the true test and foundation of all pure ornament; without the aid of that science art-combinations would cease to be graceful, and their symmetrical distribution of parts would no longer exist. So long as ornamentation is disposed as designed upon natural laws, so long will it be beautiful and endurable, for

> "A thing of beauty is a joy for ever."

But if, on the contrary, unnatural outlines and fantastic shapes be fostered, the "growth of the spreading boughs and the budding of the clustering foliage will be arrested, and an unhealthy formality mistaken for beauty."

Mr. Ashpitel, Fellow, said that there was generally much confusion on the subject of geometrical lines in decoration. Almost every line that was elegant to the eye might at the same time be mathematical and geometrical; and many lines which appeared fantastic had nevertheless been produced by the compasses. The ordinates and co-ordinates of the most difficult curves could be easily found by the profound mathematician. Cellini stated in his autobiography that he had obtained great praise in his carving and chasing, by breaking through the rules which fettered other artists. The commonest herbs and vegetables, the laurel, the fennel, and the parsley, afforded the most exquisite suggestions for architecural decoration, but whilst this was felt by every one, it was impossible to lay down rules upon the subject, or to apply the square and compass to objects of such a kind. The attempt to subject to rules the finer feelings of the mind could only end in failure,—as much in architecture as it had in music and in poetry. The greater part of what were conventionally called geometrical forms were in fact perfectly ungeometrical; and, if the leaf of a plant were examined, it would be impossible to find in it anything approaching either to a circle or a straight line.

Mr. I'Anson, Fellow, regretted that there had not been time for reading Mr. Griffiths's essay at greater length, inasmuch as, however interesting and valuable in itself, the portion which had been read had merely suggested some points which were not carried out in detail; especially the view of tracing the age of every building by the decoration of its capitals. It would further be most desirable to trace the original types of some familiar ornaments, such as the Greek honeysuckle (which was in fact as little like a honeysuckle as possible), and a peculiar flowing Byzantine ornament, the true type of which was entirely unknown. Mr. Griffith had adverted to the trefoil, as used in the early English period, but not to the twisted celery of the same era, nor to the peculiar knob or swelling lump (as he might term it) which was constantly represented in the decorative foliage of the 13th and 14th centuries. It was not necessary that architectural ornament should involve a perfect knowledge of botany or botanical forms; but the vegetable form represented should at all events give an idea *of life*, or of an endeavour to break out into life. This effect was admirably realised in the Renaissance style, where the rushing of the sap might be almost seen through the fibres of every ornament. The respective forms suitable for execution in wood and in stone might also have been referred to with advantage, and indeed the subject generally was by no means exhausted.

Mr. Twining, Contributing Visitor, observed that there was scarcely any limit to the vegetation which might be introduced in panels, friezes, &c.; but it would be desirable to distinguish between those forms which were appropriate for *decoration* merely, and those which could be properly applied to *structural* features, such as capitals and other essential members of a building.

Mr. Papworth, Fellow, reminded the meeting that the paper, as read, was but a small portion of Mr. Griffiths' essay, and he proceeded to explain the theory of that gentleman as to the steps by which the irregularity of vegetable types had been reduced to a legitimate and artistic regularity by the mediæval architects. This point Mr. Papworth illustrated by a sketch of the five-petaled Tudor rose, given as conventionalised in Mr. Griffiths' paper, by inscribing a pentagon within a circle, and repeating the operation with smaller circles and pentagons alternately.

Mr. W. Burgess, Visitor, said that, so far as his observation went (especially in France), there appeared to be an utter absence of geometry in mediæval decoration, excepting in the somewhat regular recurrence of leaves and bosses. In cornices, however, the foliage was always as conventional as possible. The ornamentation at Beauvais was *almost* natural, the stalk of the plant being shown; but at the same time it was partially covered with leaves, and to a certain extent concealed, in accordance with the feeling of the age. So in the frieze of the portal at Noyon, the stems were knarled, and not geometrical in form, and in the Sainte Chapelle, the horned caps were formed of bunches of stems put together. As a rule, he believed that the less geometry in the application of foliage to decoration the better the effect. Generally speaking, he considered that the designers of mediæval decoration had drawn with a free hand.

Mr. Pocock, Fellow, said that the distinction between natural and geometrical forms was clear and obvious. The most important question to them, as architects, was how far they ought to conventionalise nature. Poetry had been defined as "idealising the real and realising the ideal," and he considered that ornamentation should do something of the same kind. An individual plant might be too ideal, and it was then necessary to recur to the true type after which nature herself had formed it, and from that original to realise the object appropriately in the particular material employed.

Mr. Ashpitel cautioned the meeting with reference to "conventionalism" in art, and referred especially to painting; to the "thunder and lightning" school, in which the colours were mixed and applied as if with a broom; to the "suggestive style" in which a shadow from outside the picture, or a portion of a figure, was intended to convey a great intensity of meaning; and lastly to the "Pre-Raphælite school," in which high art was supposed to be reached, if the flowers in a lady's hand were wonderfully clever, although the painting of the figure might be abominably bad. Certain terms were used again and again till they became accepted, and did considerable mischief; and of all others the term "conventionalism" required interpretation.

The Chairman (Mr. T. H. Wyatt, V.P.) congratulated the meeting on the remarks which the careful labour and research of Mr. Griffiths had elicited, and a vote of thanks having been passed to that gentleman for forwarding the extract from his Essay, prepared for reading, the meeting adjourned.

ON THE ARCHITECTURE OF THE PRE-GOTHIC AGE IN GERMANY, OR THE ROMANESQUE DEVELOPMENT OF THE RHINE AND CENTRAL EUROPE.

By C. F. Hayward, Esq.

Being Extracts from the Essay for which the Medal of Merit was awarded in 1854.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, April 30*th*, 1855.

The position which the architecture of the tenth, eleventh, twelfth, and thirteenth centuries—generally known by the comprehensive term Romanesque—holds midway between the classic severity of earlier ages and the aspiring freedom of Gothic construction, gives it the peculiar interest of being a link of the great chain which connects the old with the new civilization of Europe—the close of Roman splendour with the early dawn of Mediæval art. From the Romanesque buildings of the twelfth and preceding centuries, we learn how the great transition took place from the classic characteristics of breadth, horizontality and repose, to the airiness and upward tendency exhibited in the early Gothic structures: a change which, from first to last, occupied the space of nearly a thousand years in its accomplishment. Though extensively practised in these islands by our Norman conquerors, the Romanesque style received such an impress from their hands, and was so deeply imbued with their spirit, that it has retained their name among us as a distinctive appellation. It is to the Continent, therefore, that we must rather look for the purest characteristics of the Romanesque, and especially to Germany, which, though borrowing its original ideas from its subjected Italian estates, was amongst the first to carry them out with individual design, and the last to forsake the cherished forms, and yield up its sturdy "Rundbogen" for the novel and more graceful "Spitzbogen," or pointed arch.

Along that great highway, the Rhine, many a flourishing city was planted by the enterprising sons of the mistress of the world. And now on its banks stand clustered those venerable creations of Christian art, which far excel the few traces remaining of Pagan work and classic decline. Not only, however, on this spot, but throughout Central Europe, are to be seen traces of this once popular style, modified in accordance with local circumstances and individual feeling.* Distinct from, though closely allied to the Lombard edifices of the same date, and the examples of Byzantine influence exhibited at Venice and Ravenna, these Romanesque buildings claim equal kindred with the rival forms adopted in the buildings of the early Christian Church, the flat-roofed Basilica, and the domed temple of Byzantium. And it need excite no astonishment to find such clear traces of the chief features of each, when we remember that both were founded at the same time—for the same object—on the ruins of the same development of Art.

Greece perfected the trabeated system of support. It was adopted at Rome, with the addition of a new, and, apparently, antagonistic principle—arcuation. Timidly at first, though boldly afterwards, the two were blended till confusion became the result. Order succeeded under the artistic hands of the Lombards; and the style, further improved and developed by their German conquerors, became the great and noble Romanesque, which, extending its influence from central Germany towards the north and the west, in after ages returned to invigorate the productions of its original country, the south. But, independently of their prominent position in the pre-Gothic age, and of their connection with Rome and Byzantium itself, constructively, artistically, and historically, these Romanesque edifices have a grandeur and a character of their own, and a strong claim on our attention by reason of their independant majesty and truth—a claim which has, indeed, been duly acknowledged in the well-known works of our countrymen, Hope, Whewell, Willis, and Pettit.

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* See Puttrich's Work on the Architecture of Upper Saxony, from the 10th to the 15th century. See also the Works of Moller and Boisserée for illustrations of the buildings described in this paper.

Although the types of many parts of these Romanesque buildings may be found in Byzantium—in the works of Greek artists, who had studied the arch and column at Rome itself—yet some particulars of their arrangement and construction may be derived from the early Basilicas of Rome. To the former may be referred the vaultings, the apsidal* terminations at the ends of the nave and transepts, the semi-domed roofs, the piers, the open cupolas and windows, as well as some peculiarities of detail. To the latter may be attributed the Latin cross shown in the longitudinal and transverse arrangement of the piers and arches—corresponding to the marble avenues of the Basilica, some arrangements of the apses, and many examples of flat roofs, carried by plain walls, pierced with small round headed windows. Indeed the campanile of Santa Francesca Romana† (Rome, A.D. 836), may serve as a type of those subsequently erected on the borders of the Rhine. The connection with the Byzantine types can be directly traced through the relation of Ravenna to that city. In 802 Charlemagne erected the cathedral at Aix-la-Chapelle (on the spot where a previous church was built in 543), in imitation of San Vitale, at Ravenna; and although this cathedral was altered in 983 by Otho III, yet enough remains of the base of the central cupola to indicate the style of the rest of the church. At this time in England, St. Paul's, Canterbury, Peterborough, and St. Albans, had been founded. Did the various edifices still exist which were successively erected on the site now occupied by the cathedral of Cologne, we should have a complete series, commencing from the year 94 of our era. Here Charlemagne built a church in 814 (a little later than that at Aix), another was erected in 873, and destroyed in 1248, in which year the present edifice was commenced.

It is through the works of the Lombards, in the church of S. Michele, at Pavia,‡ and elsewhere, that we must trace the connection with the *Basilican* type. In Italy this form is naturally reproduced in most of the ecclesiastical edifices of this period. The church at Pavia dates from 720 to 750; and St. Castor, at Coblenz,§ was consecrated in 836, by one who lived much at the former city. Not to mention that curious example at Lorsch (of which only a fragment now remains), consecrated in 774, in the presence of Charlemagne himself, we have, in the above-quoted instances, sufficient proof of the origin of the architecture of the Rhine. We shall see how it flourished for the next three centuries, and how, at the close of the twelfth and commencement of the thirteenth centuries, it attained its full growth under the protecting care of Frederick Barbarossa, at the very time when he was burning and laying waste the rebellious cities of Lombardy.

The less disturbed times in Germany, producing fewer warlike or palatial buildings, gave opportunity to its artists to lavish their talents on the ecclesiastical edifices of Prince Bishops, and the results can be traced even as far as Liege, in the Netherlands.

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* Yet we have in the majestic ruin of the Basilica of Constantine at Rome two apses—not opposite to each other, one being towards the Forum, and one towards the Colosseum—but this is of an age just preceding the birth of Byzantine art.

† Itself copied from an earlier one, by Adrian I, A.D. 772.

‡ "It is impossible not to see in Pavia the origin of the Rhine churches."—*Gally Knight.*

§ Louis the Pious consecrated St. Castor in 836; it was rebuilt in the latter part of twelfth century, but some parts were preserved.

Proceeding now to examine the particular arrangements which the three great cathedrals of Maintz, Worms, and Spires exhibit, we find that the grand central nave was universally adopted, generally vaulted in a semi-circular form; though pointed vaulting was very early introduced. The nave-piers are large and plain, and the arches round. Sometimes there is a triforium, but always a clerestory, with windows as in the aisles, narrow and round-headed. There are transepts at both ends, often with apsidal terminations, which are also seen at the east and west ends of the nave. Over the junction of the nave and transepts, we find a light, open cupola, generally polygonal, *not domical.* There are towers on each side of the apse. If only four, they are very nearly alike in size; though the eastern pair are somewhat smaller. If each transept also has towers, they become little more than turrets, though still of bulk and elevation enough to assist in the grand effect of grouping—as may be seen at Cologne, Maintz, Worms, Spires, Andernach, Laach, Boppart, and Coblenz. The high altar is approached by many steps, being raised over a crypt, half sunk in the ground, and generally supported by vaults on columns, exhibiting the best details. The entrance is sometimes through a cloister,* surrounding a square court. At Laach Abbey this exists entire. At Aschaffenburg there is an exquisite specimen of a cloister-court, though it is not now the chief approach. Many large churches have undergone such alterations, as to exhibit at present but few of these peculiarities of plan. At Augsburg, the tower alone remains; at Nuremberg and Munich, only portions of these general arrangements are shown; while around the latter city, and scattered over the whole plain south of the Danube, there are numerous little country churches which evince their relationship to this class of the Romanesque by their towers alone. Schwartz Rheindorf stands alone, with its peculiar double church—an upper and a lower one—under the same roof, a grand central spire, and hipped gables. It is, moreover, the best example of the circumscribing galleries. The cathedral of Bonn, being of the transitional period, is much Gothicised, and has some remarkable windows—which the church at Boppart also has. At Sinzig there is an admirable group, very much resembling that of St. Croix, Liege. The position of all these edifices was well chosen. Level tracts of country are more advantageous, perhaps, for the display of grand edifices than very undulating surfaces. The cathedrals of Maintz, Spires, Worms, &c., derive an imposing effect from the flatness of all around them, while the cathedral of Bamberg, raised on a slight hill overlooking the city obtains additional grandeur from its terraced front. Limburg is finely placed; but the secluded site of Kloster Laach is extremely beautiful, surrounded by abundant foliage, which extends over the surrounding hills, and encloses the still waters of the adjoining lake.

The constructive requirements for carrying the flat roofs, peculiar to the Italian and Basilican type, were simple; but in vaulting such spans as that of Spires (45 ft.), more care was requisite. Large piers, generally square, with pilasters or semi-shafts attached in front to carry the vaulting, bear the arches of the nave,—but between these great piers a smaller one is often placed, which, with the corresponding halves attached to the sides of the great piers, carries subordinate arches, and is continued upwards to form clerestory compartments beneath the great arch of the nave. This arrangement permits the sub-division of the vaulting of the aisles, (which are generally half the width of the nave) into two squares; and so long as only the semicircular arch was used, the square was necessarily the plan of every compartment or vault of the nave. When the pointed arch was introduced, greater freedom in this respect was obtained, and we see it used in the *transverse* arch at Maintz, and both longitudinally and transversely at Worms and Bamberg. The square vaulting of the aisles, and the intermediate piers were continued however long after this improvement, and I consider this subordination of arches to be a feature, which, like the orders of tracery at a later period, gives great effect and lines of shadow, hardly to be expected in buildings with mouldings of so plain a character. The caps of these vaulting shafts are often boldly carved, as at Spires and Laach, and the latter even now retain some remnants of the colour with which they were originally covered. The impost mouldings of the arch piers are large and plain,—those of the subordinate ones are often not carried round the face in front. Most of these great churches have only a plain wall above the nave arches, or they sometimes exhibit smaller decorative arches beneath the clerestory. A gallery called "männerchor" or "mannhaus,"* formed with large openings and a floor over the vaulting of the aisles, has a decided correspondence with the triforium—a great feature of the later styles. England has many examples of the triforium, but, Boppart, Andernach, Sinzig, and a few other smaller churches, are all the examples in Germany; and it is decidedly a Byzantine feature, as is also the vaulting of the apses by semi-cupolas, instead of the groined vaults which succeeded. The position of the apse has been already mentioned, but it remains to state that smaller ones were occasionally built in the east wall of the eastern transepts, as at Laach and Sinzig,—(like the Basilican tribunals,) and in this case there are no north and south apses. The towers vary much in form, being square, polygonal, or round, and occasionally passing from one form to the other at the dividing stages; but their construction, or constructional ornamentation, is always the same. At the angle of the square, a strip of wall projects very slightly from the face. These flat pilaster strips, or incipient buttresses, are united several times in the height of the tower by flat bands or a series of mouldings, carried on corbel tables of small round arches. In the panels thus formed, roundheaded openings, single, double, or united under one common arch head, are inserted. Sometimes, in the centre of the wall, a flat strip corresponding to the projection at the angle, is carried up to join the horizontal string, and is often continued above it to the very top of the tower. The two series of panels thus formed are pierced by windows.

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* Compare the Atrium at San Clemente, Rome; at San Ambrogio, Milan, A.D. 861; and at the Cathedral at Salerno.

This system, (a decided Lombard importation, and seen later in our own Norman and early English,) is carried out in every wall. Cornices and eaves courses are supported on corbel tables of round arches. The apses, whether round, semi-octagonal, or semi-decagonal, are decorated in the same manner, the aisle and clerestory windows occupying the panels. Occasionally modified and varied round rolls are carried up the walls, and tied by horizontal rings of mouldings round the tower itself; a series of larger arches is sometimes carried round the walls on corbels only, without any vertical lines of support from below.† When it was required to cover a round tower with a roofed of a polygonal form, the transition was easily accomplished by one or more of these projecting arches on corbels, and in this arrangement we sometimes observe a point in the arch coinciding with the face of the wall, exactly as the Byzantine pendentive. The system was carried out even further by the introduction of the trefoil-round arches and multifoils of pointed as well as round forms, in later examples. Wherever we meet with a building of the Romanesque period we have this characteristic, common enough with us under the term corbel table. The Normans used small carved blocks, as well as corbel arches, and their successors carried out the principle. But in Germany these corbel arches seem to have been so highly appreciated that many complete Gothic towers are formed in this manner, which seems to be peculiarly applicable to brick constructions. The two towers of the Frauenkirche, (Cathedral) at Munich, 318 feet high, (built 1488) and other churches of the same city, have bands of ornaments of this character in carved or moulded brick. The Lombard churches, of course, show this system more or less, and even in the revival we see it carried out in unmatched boldness in the cornice of Florence Cathedral, and in the Campanile of Giotto, to say nothing of the extent to which it was employed in Italian brickwork.

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* Whewell, "Architectural Notes on German Churches," pp. 91, 92.

† Compare the tower of the isolated Chapel at Laach with the tower of the Church of Sompting, Sussex, of about equal proportions.

In almost all the modern buildings in the neighbourhood of these early examples this feature is reproduced. In the towers or walls of Laach Abbey,* nearly all the peculiarities above-mentioned are to be seen, and the little detached tower in the grounds adjoining, may serve as a model to illustrate these remarks.

Exceptions prove the rule, and the church at Boppart, which is peculiar in many other points, has no vertical strip in the two towers, but one immense horizontal one, in the shape of a gallery, connecting them at the base of the spires.

In the roofing of these towers a peculiarity exists which has not been directly imitated in any succeeding style, the walls being finished with very high pitched *pediments*, the horizontal side or base of the triangle having mouldings similar to those which form the raking cornice of the roof. Here we see a remnant of Roman art, which was never carried further, the *gable* of a higher pitch, without the horizontal base, being universally adopted. The square ends of the walling, in any position, are finished in this manner, and the pitch of some of these pediments in the transept ends, is still more in accordance with the classic type. The polygonal walls of the apses have often each face terminated by a pediment, and octagonal towers, as at Sinzig, St. Croix Liege, and even the walls which support the immense spire at Bonn are finished in the same fashion. The ridges of the roof being carried up from the apex of these pediments, meet together at an acute angle, and thus form a kind of spire, terminated by a vane and an ornamental cross. The flat surfaces of the roof between the sides of the pediments and the ridges of the spire are consequently of a diamond shape, and when scored with the diagonal lines of slate roofing, have the appearance of being ornamented with scales, the slates being always rounded at the corners. The angle of these roof ridges varies, but it is generally acute, and more so the nearer the whole approaches the form and character of the spires of a later period.

In England, we have but one solitary specimen at Sompting in Sussex; but it is a perfect pattern of the Rhenish tower and spire. Whether the spires of St. Martin, Cologne, and Schwartz Rheindorf are original is uncertain,—but if so, they are the precursors of our common hipped broach spires, being octagonal on a square base. Along the banks of the river Maine, at the Pfarrkirche at Aschaffenburg, the villages of Erlenbach, Miltenberg, &c., are seen small, but more elaborate specimens, in which the octagonal spireis complete, with a rib springing from the base as well as from the apex of the pediment. On the borders of Switzerland, by the Lake of Constance, and the upper part of the Rhine—thence to Schaffhausen,—these forms occur, varied according to circumstances. But the pedimented spire is not the universal roofing for towers, but it is reserved for the better class, or the most important of a group. The ordinary eaves roof forms a square spire on a square tower, or a polygonal one on a polygonal base. The example of Laach gives the latter form on two circular towers at the west end and the eastern cupola; and the former on the two at the opposite end, while the square form of the west cupola, being the most important feature, and the highest of all the six, has four pedimented faces. Many examples of (now) isolated towers, occur on the Rhine, one large one near the mouth of the Lahn, nearly opposite the castle of Stolzenfels. It is to be remarked that during the whole of this period the character of the spire was essentially that of a *roof* or covering for protection, and it is not till a much later date that we see it assuming a more important ornamental character, and constructed solidly in stone. The later we see it, the more resemblance it has to those succeeding constructions, which were consummated in such masterpieces of gothic lightness and skill as Freiburg Minster.

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* Damaged by fire within the last few months.

But there is yet another class of small country church towers, which are found in the plains round the cities of Augsburg and Munich, on the Danube, and towards the mountains of the Tyrol and Switzerland, of a form so common that twenty or thirty may be counted in a day's journey, and sometimes when an extensive view is obtained, at least half a dozen can be seen at once. Meyringen and Pasing are two of them, and they have simply two gables, instead of four, and an ordinary high pitched roof. The earlier examples have pediments and not gables. Some on the Rhine have a small gable in the centre of the tower, but this disposition is best seen in the four elegant spire-capped towers of Bamberg cathedral, which are carried up eight stages, and finished with gables and spires of a pink colour, (copper) surmounted by an elaborate gilded cross. Seven of these stages have corbelled bands and round-headed openings. An elaborate doorway is placed in the lowest stage on either side of the semi-decagonal apse, which is itself excessively rich in carved mouldings. The plain eaves roof of this apse, terminating on a cornice, *not* on a corbel table, butts against the face of the large gable forming the end of the nave wall, whose raking lines *are* carried on a corbel table of round arches, and which is pierced with plain round openings. This gable has its base at the upper string of the fourth stage of the towers, and is finished like the spires with an elaborate cross. The eighth or upper stage of these towers is of a later date, and corresponds to the chief part of the western towers to be further described. The plan of this upper stage is square, with the angles chamfered off,—or, rather, with semi-octagonal turrets added thereto, formed of shafts carrying pointed arches. The spires correspond in plan, being octagonal, but having the four sides at the angle less than the others, and the ridge does not spring from the apex of the gable which crowns each face of the tower. These gables exhibit a great deal of most beautiful work, and are formed by a boldly moulded and sculptured cornice, which is carried horizontally round the top of the semi-octagonal angles. The face of these gables is also elaborately pierced with three round arches, the centre one running to the top, and having a pinnacle inserted in its opening, and at each side above the other opening, a quatrefoil panel. The apex of each gable is crowned by an ornament, and the richness and lightness, combined with boldness of detail and elegance of proportion of the whole, are unsurpassed by any building of this class. Yet the towers at the opposite extremity are even more worthy of attention, as they have been rebuilt in this later style from the fourth stage, and so possess four stages of the form just described as terminating the twin towers at the east.

The lightness of these open angular turrets when seen in detail from the interior of one of them, or at a distance, when the sun setting behind them detaches the shafts and arches from the body of the tower, is an architectural triumph worthy of the noblest style of art.

The interior effect of the Romanesque churches is mainly due to the use of the open *cupola*, which is placed at the junction of nave and transepts, and though of various forms, always gives dignity and power. Acknowledged to be the redeeming feature of the Classic Renaissance, the grandest of the Byzantine and of the Romanesque, it is a matter of surprise that its value seems never to have been duly recognized in the later Gothic. The question of the Gothic dome has been frequently raised of late, and it is not impossible that the present century may see it satisfactorily solved.

At Laach, the eastern cupola is octagonal; the western one is square with pediments and a spire. At Sinzig, at St. Jacques, and St. Croix, Liege, the central cupola becomes a tower—octagonal, with pedimented faces, and a spire with ridges at the base, not at the apex of the pediments. At Worms, there is one cupola over the transept at the east end (flanked by round towers), which is octagonal, having an ogee shaped roof (not the original covering). Spires cathedral has an additional circular one at the west end, but it is difficult to say how much of this is original, on account of the many disasters which have happened to this portion of the edifice. The cathedral at Maintz has an octagonal cupola at one end, of a highly mixed character externally; the base being decidedly Romanesque with the usual gallery; then a stage of later work, upon that another, with a parapet of a different style—the whole crowned by a smaller octagon, finished with Renaissance work; but the whole being built of the same peculiar red sand stone, has by no means an incongruous appearance at first sight.

The west fronts of many of these buildings are peculiar for the box-like form of the walls at the base of the cupola, carried down to the ground in square masses, and having a lean-to roof against the sides of the cupola wall itself; such is the case at Laach, where the heaviness is relieved by the gallery under the eaves of this lean-to roof. A church at Worms, St. Paul's, with a front partly in ruins, has a different arrangement, and though somewhat altered by succeeding styles, bears evident marks of the Romanesque. A parallelogram is set lengthways before the body of the church, with its cornice and roof elevation towards the street, and its gable ends (on raking corbel tables) towards the north and south. In the centre of this roof rises an octagonal cupola. On the north of this (and probably formerly on the south also), *behind* the block of the front, is a round Romanesque tower with four vertical bands and a cupola, at the base of which there are four pedimental lucarnes, or gabled dormer lights, placed *upon* the upper string or cornice, and not being part of it; a series of smaller ones ranges above these lights.

A church at Strasburg, St. Thomas, also has much of this arrangement in its west front, but a square tower, instead of an octagonal cupola, rises in the centre of the roof of the parallelogramic block, over a round headed door and circular window. The gable ends have more openings and a central buttress for part of the height, with an open gallery at the base of the raking lines of the gable, which has no corbel arches. In this tower, one stage above the apex of the roof is evidently Romanesque, with a cornice and corbel table, and an angular stair turret; but it is finished with later Gothic work of a plain character. Another church at Strasburg exhibits remains of this style. The front of St. Peter's Church at Munich, though much altered, presents a similar arrangement, but here the *tower* also is parallelogramic.

Nothing contributes so much to the lightness and gracefulness of character which some of these buildings possess, as the open galleries surrounding them on the exterior,* and in many cases in the interior also; this latter arrangement, shewn in the *männerchor* or triforium, has been previously mentioned. Small shafts resting on appropriate bases, and carrying grotesquely carved and foliated capitals, support small round arches, and form between themselves and the wall a passage way round the building, of which the church at Schwartz Rheindorf, is an exquisite example. The detail of the little columns will generally more than repay the trouble of ascending to examine them; every cap is different, and though frequently of grotesque design, often wreathed with delicate conventional foliage of bold and effective execution.† The cloisters very commonly contain shafts doubly set, as at Laach; an arrangement in which we recognize a close connection with the architecture of the South, as the Romanesque of Provence, Lombardy, and all Italy present this feature.

The window openings are of a very plain character; generally single, though sometimes double, or placed side by side; with or without an enclosing arch; in gables, or as a triplet, having the centre opening taller than the side ones, and a round arch enclosing the whole. The wheel windows, large and small, though not a very numerous class, would in themselves form a very interesting study; in some, plain flat tracery is decidedly developed, akin to what may be found in Italy, when "Gotico Tedesco" was first imported at Assisi, A.D. 1228. But, besides these, the later examples, though still comparatively early in the style, exhibit a wonderful play of fancy in the form and arrangement of small openings. The little isolated tower at Laach contains a curious variety—trefoil, quatrefoil, fan-shaped, quatrefoil in a diamond, trelobed, and octagonal; but these are chiefly small openings placed beneath the round arches of the corbel tables.

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* Compare San Donato at Murano, Venice; SS. Giovanni e Paolo, Rome; San Fedele, Como, Chiaravalle, near Milan, &c. &c.

† There is a tall tower-gateway at Spires, which illustrates the *effect* of these open galleries beneath cornices most happily: it is in itself a noble structure.

In such transitional buildings as Bonn, Limburg, Sinzig, and Boppart, the aisle and clerestory windows exhibit a curious complexity of form, independently of the pierced tracery of the circular and wheel windows. The principle on which they are formed seems to be the surrounding a plain arched opening with splayed round foils, extending beyond a semicircle, the splay being continued below, as usual, parallel to the window jambs. A clerestory compartment at Boppart has a pair, each under a round headed arch, and connected by a square lined trefoil. The lower windows in the choir resemble the common escutcheon of a lock, but the range above has long round headed openings enclosed in a round archivolt, supported on shafts, which shafts also carry each side of the *round* or *pointed* archivolt, and this mural arcade is continued round the polygonal apse, grouped into one round and two pointed arches to each window, a double or clustered shaft being placed at the angle, or where two groups are connected. The arrangement has quite an early English effect, and the date is of about the middle, though the body of the church and towers date from the commencement of the 13th century.

The doorways, though generally of a plain character, are more often decorated than the windows; there are some elaborate specimens to be found at Bamberg Cathedral, in the eastern towers on each side of the apse. They are composed of diminishing orders of roll mouldings, carried on shafts set in the angles of the wall; most of these shafts are plain, though some are fluted and zigzagged as in our own Norman work. The two innermost archivolts exhibit star ornaments, and the capitals are enriched with carvings of angels and foliage. The north-east doorway, which is more elaborate, is formed like a porch, with a projecting corbel table, cornice, and roof. It displays eleven pair of nook shafts; the caps of six pair are carved to represent human forms, the remaining five have ordinary moulded and foliated caps. The north-west door is of the same character.

On looking closely into the details and mouldings of early German churches, we recognize the propriety of the term "Romanesque." In the cornices we find the hollow and round alternating, with the dividing fillet constantly occurring, while all the base mouldings follow the Attic type. The capitals, we admit, though individual and spirited designs, and of great variety, are often carved after Classic models; but the simplicity of the whole, and the richness attained, without the sacrifice of this great virtue, is a principle certainly not copied from the latter efforts of the Roman empire.

We cannot doubt that the interiors of these churches received the best decoration of the age. De Lassaulx, in his remarks on St. Gereon, Cologne, speaks of a church on the spot in 595, "named after the Golden Martyrs, probably because this church, like many others at that period, contained mosaic pictures on a gold ground;" and "Bishop Carentius is celebrated in a poem, as the restorer of golden temples." The present decagon of St. Gereon is decorated with color; traces of color also remain on the caps of the shafts, &c. at Laach Abbey. It cannot be supposed that large vacant spaces of wall would remain undecorated with fresco, when we remember how they were assigned in the Basilicas and Italian buildings of the same class as these, to display the powers of the artist. The spirit of revival in the present day and the spread of the arts at Munich, the capital of a state which possesses the largest Romanesque Cathedral, at Spires, have been the means of restoring this last named building to something like its former grandeur, if not indeed surpassing in completeness any previous period of its existence.

Having now arrived at the limits proposed for this Paper, it is not without regret that I leave the theme, desiring to carry the sketch still further through the transitional period to the complete establishment of Gothic architecture in Germany—in the mighty cathedral at Cologne, at the very time when Romanesque artists were at work upon the church of St. Cunibert, A.D. 1248. But one building of the transitional period deserves a passing notice; though the churches at Bonn, Limburg, Boppart, and Sinzig—to say nothing of the later parts of the larger edifices, at Cologne, Coblenz, Andernach, &c. &c. — would each furnish ample materials for a separate essay. The apse of the church is all that remains of the once grand Cistercian Abbey of Heisterbach, begun 1202, completed 1233. Semi-octagonal above, but semi-circular below, it is divided into an upper and lower stage by a string of mouldings. The upper story is composed of five stilted round arches, pierced as windows, on shafts running into the groining and forming a five-partite vault, the groins meeting at the apex of the chancel-arch. The lower stage consists of five corresponding arches on detached shafts—but these arches are *pointed.* The shafts stand upon a low wall. The aisle wall is continued round the inner wall of the apse; and the passage thus formed is itself divided into two vaulted aisles by a series of detached shafts. The vaulting over these double passages with the outer walls supports the buttresses, which resist the thrust of the semi-octagonal vaulting of the apse. The whole arrangement is very pleasing, and the detail is worthy of remark. But I must not further continue this subject, however enticing, though I cannot but feel the imperfection of my sketch of the phase of Romanesque art which characterized the architecture of the Pre-Gothic Age in Germany.

Mr. G. G. Scott, Fellow, observed that in his visits to Germany he had generally been in search of architectural specimens of the thirteenth century, and had therefore paid less attention to the interesting edifices described by Mr. Hayward. He might suggest, however, as an interesting inquiry to antiquaries, an investigation of German architecture even before the period now referred to. For example, nothing was known of the architecture of the Franks between the days of Clovis and Charlemagne—a period of 400 years—which, so far as he was aware, was not illustrated by any existing remains. There were also very few examples indeed from the time of Charlemagne to that of Otho I. Many existing buildings—as St. Castor at Coblenz, &c.—were mentioned as *founded* in that era; but so small a portion of those buildings, as they now stand, were really of that date, that none but a very careful antiquary could find it. The accuracy of the term "Lombardic," as applied to this style of architecture, was also an interesting question. He confessed that he could not bring himself to believe in the great antiquity assigned to San Michele, &c. at Pavia, in which the style was supposed to have originated. These were ascribed by Mr. Gally Knight to the seventh century; but, inasmuch as the north of Italy was desolated by the Huns in the tenth century, and as the churches of Pavia so closely resembled those upon the Rhine, he (Mr. Scott) thought it more probable that Otho I. had been the originator of the early churches in both countries. The most probable date for the early Romanesque churches of Germany was the period of the three Othos (from about A.D. 960, to about A.D. 1000), although some of them were doubtless founded upon earlier churches. In fact, the *best* specimens of Romanesque in Germany were of extremely late date. He imagined that the church of Laach—referred to by Mr. Hayward—bordered upon the transitional period; and the best and richest specimens at Cologne were of the same date. The workmanship of the German Romanesque appeared to be far superior to that of the corresponding style [Norman ?] in England;

but the style flourished in Germany till a much later date than in this country. The Abbey of Heisterbach (which was pure Romanesque) was, indeed, not finished till about 1230. Notwithstanding these facts, antiquaries had persisted in regarding the Gothic as a German style; whereas Germany was twenty years behind England, and at least fifty years behind France, in its adoption.

Mr. Lockyer, Associate, said that throughout France—and in the southern departments especially—there were remains of Romanesque edifices, much earlier in date than those of Germany, and exhibiting all the characteristics usually ascribed to Saxon architecture in England. He concurred with Mr. Scott, in believing the German specimens to be later than those of France and England. Central Italy presented some churches of a very early type, especially at Pistoia and Lucca. The church of San Giovanni, at Pistoia, had small circular-headed windows, and was entirely encircled with an arcaded band. The sculpture, also, was peculiar; and bands of coloured marble (chiefly green, or black and white) were introduced. Possibly these remarkable churches were of the time of the Othos; but they did not appear to have been imitated in the German churches. The style generally called Lombardic did not, in fact, appear to have been practised in Lombardy; and therefore the application of the term was a question for investigation. Mr. Lockyer, in conclusion, corroborated Mr. Hayward's remarks on the extreme beauty of the site, and the architectural effect, of the cathedral of Bamberg.

Mr. Twining, Contributing Visitor, made some observations upon the cathedral at Drontheim, in Norway, erected in the 11th century, which bore some resemblance to the German churches under consideration. It had a small (detached) tower or belfry of singular shape, with a cupola of Byzantine character. The appearance of Romanesque features in Norway could not be regarded without interest. Mr. Twining also referred to some churches situate between Stockholm and Upsala, founded about A.D. 1000, which resembled in character the Saxon remains in England. In one of these churches there was an inscription referring to the migration of the Swedes to Switzerland, a fact referred to in Schiller's "William Tell."

Mr. Papworth, Fellow, adverted to the curious fact (recorded in the Chronicles) that one or more of the Swedish Cathedrals were built by the men engaged on the church St. Germain des Près. He begged to ask for some further illustration of Mr. Hayward's opinion that the progress of architecture extended from Germany into France and Northern Italy, and so southwards. The churches at Coblenz, &c., frequently called Byzantine, were merely octagonal buildings vaulted, and not *domes;* and this he considered was a proof of their Frank origin.

Mr. Hayward said that he had been careful in deriving the origin of the Romanesque style from the antagonistic principles of the Basilican style at Rome, and the style of Byzantium itself. He did not derive the Romanesque of other countries from Germany, but spoke of its peculiarly grand development in that empire. Mr. Hayward referred to some dates in support of his views:—S. Sophia, Constantinople, and S. Paul, without the walls, at Rome, (both before A.D. 400) might be taken as the two types from which the Romanesque style sprung. S. Vitale, at Ravenna, was copied from S. Sophia, and the church at Aix-la-Chapelle, from S. Vitale. Charlemagne died in 814, and if he built the parts now remaining of Aix-la-Chapelle, and was also connected with Lorsch, he must have introduced the style into Germany. With regard to the churches of Pavia, he believed that the peculiar style of the ornaments and carving indicated a date very soon after the decline of the Roman Empire. S. Giulia, Brescia, S. Frediano, Lucca, and many other churches were assigned to the same period as the churches of Pavia, the 8th century and the connection between Pavia and the Carlovingian Sovereigns of Italy in the 8th century afforded, as he believed, a good reason for the introduction of Lombard architecture into Germany. Coblenz followed about 30 years after

Aix-la-Chapelle, and in the 10th century the great cathedrals of Worms, Mainz, and Spires, were founded, in all of which parts of the original work remained. In the Island of Torcello, near Venice, the cathedral and a neighbouring church, S. Fosca, presented respectively the distinct types of the Basilican and the Byzantine styles; although they were ascribed to about the same date.

The year 1100—the age of the 1st Crusade, is the great central date for the Romanesque development—while *in England*, Tewksbury Abbey, the Cathedrals of Gloucester, Worcester, Durham, Salisbury, Canterbury, Norwich, and the curious brick Church of St. Botolph's Priory at Colchester were in course of erection. *In Italy*, the Cathedral of Modena, &c. *In Sicily*, that of Messina, &c. *At Jerusalem*, the Chapel of Godfrey of Bouillon. *On the Rhine*, Laach Abbey, Maintz, Worms, and Spires Cathedrals, are supposed to have been in progress.

1125—a quarter of a century later, is the date of the Apse of S. Donato at Murano.

1150—after the 2nd Crusade, we have *in England*, Iffley and St. Sepulchre's Northampton. *In Italy*, the Baptistry of Pisa. *On the Rhine*, the Church of Schwartz Rheindorf.

1175—*In England*, the Galilee, Durham, and parts of the Temple Church. *In Italy*, the Tower of Pisa, and just before 1200, the Cloisters of St. Paul's without the walls, and St. John Lateran, Rome. *In Germany*, the Chapel at Murrhardt.

1200—just after the third and before the fourth Crusade—*In England*, parts of the Cathedrals at Lincoln, Ely, and St. Albans. *On the Rhine*, Boppart, Limburg on the Lahn, &c.

1210—*In England*, Beverley and Salisbury. *In France*, Amiens, Notre Dame, Paris, &c.

1220—*On the Rhine*, Coblenz, Sinzig, Heisterbach, Gelnhausen; *at Cologne* St. Gereon, &c.; *and in the Breisgau*, that marvel of the next style, Freiburg Munster, commenced after the 5th Crusade.

1230—We have the return of the German influence, southwards, and *in Italy*, the Church of San Francesco at Assisi, the first built in the style of the "*Gotico Tedesco.*"

Thus we see that the great consummation of the style at Boppart and Limburg, was about the year 1200, when England had made a great advance upon the Romanesque. After that period came Heisterbach, &c., and the style went on improving till the German taste was re-imported into Italy, in the Church of S. Francisco, at Assisi, about the year 1230. There could be no question that that church was built by German architects and German workmen; it was the first really Gothic church in Italy, and the parent of all the others.

Mr. A. J. **Baker**, Associate, read Mr. Hope's definition of the term "Lombardic."

Mr. G. G. **Scott**, said, that in respect to the buildings of Pavia, the difficulty was to ascertain what part of the existing fabric dated from the original foundation of the edifice. In our own cathedrals, only portions of the crypts were of the original date. One of the doorways at Pavia, ascribed to the 8th century, exactly resembled another from a castle in the Tyrol, to which the date of the 12th century was assigned. Mr. Hope, he believed, was the first to use the term "Lombardic," but, although the style to which it was applied had no doubt originated in Lombardy, it might be questioned whether it was the style of that kingdom *before the time of Charlemagne*. It might have been adopted at the re-edification of the churches of Pavia.

In reply to a question, Mr. **Hayward** stated, that the figures of lions or griffins supporting columns, &c., so common in Italian architecture, were not found in Germany.

Mr. **Fergusson**, Associate, remarked that, the history of Lombardic architecture had been more fully investigated by Rumohr, than by any other writer. In his work, a distinction was drawn between the Longobardic and the Lombardic styles. Of the former, he stated, that no remains now exist. It comprised the buildings erected before the time of Charlemagne (from the 6th to the 9th centuries inclusive), but these, as Italy increased in wealth, were all pulled down and rebuilt. San Michele, Pavia, was, in Rumohr's opinion, erected in the 11th or 12th century, the materials of the previous church being employed, and these were in many instances reversed. There were many Romanesque churches in Italy, and a complete series of them might be found in the churches about Rome; but there were no *Gothic* churches in Lombardy till after the beginning of the 11th century. It should be observed, that the Valley of the Po and the Valley of the Rhine belonged to the same empire from the time of Charlemagne downwards; and the same style prevailed in the one district as in the other, the churches being nearly identical. It was not correct therefore to say, that the Rhenish churches were derived from Lombardy, or the Lombard churches from the Rhine. In England the case was different, our Norman architecture being clearly derived from France.

The CHAIRMAN (Mr. PENROSE, V.P.) proposed, and Mr. SCOTT seconded, a vote of thanks to Mr. Hayward, which was carried unanimously, and the meeting adjourned.

The paper on the Architectural Medals of Classic Antiquity, read at the Ordinary General Meeting of the 16th April, 1855, requiring numerous illustrations, it will be published by the Author, T. L. Donaldson, Hon. Sec. For. Cor.

SUMMARY OF A REPORT MADE BY MONS. RÉMONT, ARCHITECT OF THE CITY OF LIÉGE, ON WORKS RELATING TO THE HEALTH AND PUBLIC UTILITY OF LONDON.

Communicated by W. L. Donaldson, Honorary Solicitor.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, May 21, 1855.

In the year 1849 the attention of the civil authorities of Liége was directed to the rendering more healthy the crowded localities of the city, and to the improvement of the system of constructing the sewers; also to the paving of the streets, and the supply of water, as well for the service of public health as for use in private dwellings, and for the purpose of drinking.

The desire of introducing into these different parts of the administrative economy the improvements already realized in the neighbouring countries, especially in England, determined the College of the Burgomaster and Magistrates to propose to the Communal Council to send the Architect of the city to London, in order to study the system of public works of that great city, and to report on the various subjects all the information necessary to instruct the administration of the City of Liége with regard to works it was itself about to execute.

The Committee of Public Works decided that investigations should be made chiefly upon the following points:—

1st. The distribution of water.
2ndly. The different systems of sewers.
3rdly. The like of paving.
4thly. The like of lodgings for workmen.

Mons. Rémont departed for England, where he was engaged a considerable time in fulfilling, as completely as possible, the object of his mission, and on his return he arranged the numerous materials of information he had collected, and submitted to the Administration the result of his observations and of his studies.

In this his Report he states, that he had examined chiefly the distribution of water for drinking; the construction and the cleansing of sewers; the cleansing of the streets; the construction of the dwellings for workmen; the better mode of paving streets and pathways; the system of construction of privies and urinals; the establishment of baths and wash-houses; the service of fire-engines. In short, everything which relates to works for public health and utility.

The first chapter of his Report relates to the supply of water, and after pointing out that the chief cities and towns in England and Scotland had organized companies for the supply of water, he traces the history of the supply in London from Peter Morrys, who founded the works at London Bridge, under the name of the Southwark Company, in 1581, and which was done away with in 1823 and united to the New River Company whose works had been commenced by Sir Hugh Myddelton in 1613, up to the present day. He gives a detailed account of the various existing water companies, and their amount of supply, with very minute statistical tables of the quantity and species of services in all cases. He also gives an explanation of the quality of the different waters, remarking that, according to the laws of health, water for drinking to be good should be clear, colourless, without taste, without smell, fresh in summer, temperate in winter, should contain atmospheric air and a small quantity of bi-carbonate of lime; in short, should not hold in solution either organic matter or sulphates of lime, nor any calcareous salt, the carbonates excepted. And after some further consideration of the subject he states, that one would understand from thence that the waters of the Thames, which is considered, and with reason, the greatest sewer of London, could not, notwithstanding the purifications to which they were submitted, satisfy the conditions required for being fit for domestic purposes.

He describes the system of purifying the water in the reservoirs of the different companies, and also the additional plans for effecting this by filtration.

The details upon this branch of his inquiry are very full, as also upon the mode of supply, the high and low service, and the question of intermittent and constant supply.

This chapter is illustrated by three large plates of diagrams, and he sums up the chapter with the following observations:

"One sees, moreover, that the English begin to understand that a good supply of water in a city cannot be the object of a speculative affair; that a supply without limit ought to be made at the simple price of the cost of the distribution; and that it can only be efficiently organised, regulated, and carried out by the magistrates who are entrusted with the very important interests of order and of the public health."

The second chapter is upon the sewers. In this he describes the local position of London, the amount of its population, the number of houses, the extent of its streets and ways, of which he states three-fifths have sewers under them.

He gives a short account of the Commission of Sewers established in the reign of Henry the Eighth, and of the system of management of the present day; and he enters very minutely into the construction of sewers, their forms, their inclination, the system of flushing, trapping, and the cost of construction. He also describes the lately introduced tubular or pipe drains for connecting houses with the sewers. He gives a summary of various reports recently submitted to the consideration of the Commissioners of Sewers and the public, for more effectually draining the metropolis, and he adds tables and numerous diagrams of the forms of sewers and the modes of connection, as well those employed as those suggested. The whole subject of sewage is very fully entered into, but it is observable that the chief source of his information is drawn from a prejudiced quarter.

The third chapter is upon urinals and public privies.

He commences by observing, that householders in London consider the foot paving as forming in some measure part of their houses, so they keep it in a state of perfect neatness. Every where the vigilance of the police and the rigour with which it causes its regulations to be observed contribute greatly to this result; but this strictness produces this other result, that often when much pressed one rarely finds in London a place where one is permitted to make water. He observes that there are, however, some public urinals in some side streets, formed of two or three inclosures of stone, shaped according to the places where they are put; but he complains of these not being arranged in a sanatory manner, and that, although water is so abundantly supplied in London, and could be so easily introduced into the urinals, they are not washed with it, and that the urine escapes through gratings, leaving very offensive and pernicious exhalations. He praises, however, the mode in which these urinals are constructed, being enclosed, so that a party within is concealed from view, and there is an injunction written up for a decent arrangement of the dress before leaving. He praises very much the urinals in the London and North Western Railway station, as containing all the requirements for such a convenience, and he describes those in the Athenæum Club as excelling even the very good arrangement at the railway station. He describes also the public privy which was constructed, as an experiment, in the year 1849 in Rose Street, and among other systems upon this head he describes fully, and with explanatory diagrams, the plan proposed by Mr. Hosking for collecting the solid contents of the public and private necessaries.

The fourth chapter is upon the carriage ways and foot pavements, and in this he enters into a full examination of the granite paving, the wood paving, and the Macadamizing, which he says is called in Belgium "Empierrement." He minutely describes the two modes of laying the granite paving, the one in lines perpendicular to the axis of the street, the other in lines oblique to this axis, and in an angle of 45 degrees, and he enters into a full discussion of the subject, including in it the cost of the various modes of paving. He makes particular mention of the new mode of laying the paving at the London and North Western terminus, which he calls "pavage Taylor." With respect to the foot pavement, he speaks highly of the pavements of London, and he considers that the mode of paving is one of the most important and most useful works that this great city has accomplished. He remarks that in some narrow streets, where two carriages could not pass each other without sacrificing the convenience of the foot pavements, the carriage way is lessened so as to allow of only one carriage to proceed, and a wide space, either at the middle or at the end, is left to admit one carriage to pass the other.

In chapter five he proceeds to describe the mode of cleansing the streets, and he traces the different modes of effecting this from the earliest times to the system of the present day. He describes the water carts, and the patent machines for cleansing which used to operate in Regent Street, and which were first used at Manchester, Birmingham, Leeds, and other large provincial towns, before they were so in London.

The sixth chapter is devoted to the important subject of the dwellings of the working classes, and he traces the history of their establishment. He remarks, that Dr. Southwood Smith truly observed that a house arranged according to the requirements of health and comfort, contributes essentially to the well being of the family; inspires it with ideas of regularity, of peace, and economy; causes to arise insensibly in it respect for order and the laws, altogether causing in it the knowledge of the necessity of fulfilling the duties that the social state imposes upon all good citizens.

He describes the formation of the Society for Improving the Condition of the Labouring Classes some years since under the patronage of Queen Victoria and the Prince Albert. He traces the progress of the Society in not confining its operations to the cities, but extending itself to the country and erecting model cottages, of which several designs are given. In his observations he shows how much is due to Mr. Roberts, the architect, for his attention to the subject, and he refers also to Mr. George Beck, the architect of the St. Pancras dwellings for families. As in the other subjects, the statistical tables are very full and instructive upon the different points of expenditure and the returns. The details as to the ventilation, the supply of water, the lavatories, and other matters, are likewise minute and clear.

A very full description of these dwellings is given illustrated with plans and sections. He traces the first steps of the Society in taking old houses and adapting them to the desired purposes, as in Charles Street, Drury-lane, and in Hatton Garden; to their building a model lodging house themselves, as in George Street, St. Giles's, where the Society could carry into effect their whole system of the supply of water, gas, and other conveniences, with the consideration, at the same time, of making the rent as low as possible.

Chapter seven is on the establishment of the baths and wash-houses.

He traces, from the first establishment of eight baths and twenty wash-houses at Liverpool, the progress of this system to the great establishments in London in the present day. The details upon this very interesting subject are very full and equally minute as on the other matters of inquiry, and are illustrated by many tables and drawings.

He calls particular attention to the extensive employment of slate in the baths and washing places, as a substance not susceptible of change by the influence of the hot and damp atmosphere, and not liable to be impregnated with deleterious or offensive substances.

The eighth chapter is on the expedients in case of fire.

He mentions the regulations in parishes, by Act of Parliament, to have two pumps always in good order, and in consequence of the insufficiency of the parochial arrangements, the subsequent establishment of the Fire Engine Brigade, which was founded and is supported by the different Fire Insurance Companies in the metropolis. He describes also the Society for the Protection of Life in Case of Fire. The details he gives of the Fire Engine Establishment and its system of regulation are very full, and interesting to those who may not be acquainted with its operations; and the engine used in London obtains his warmest approbation. The fire escapes also engage largely his attention.

At this part of the work he enters into a short account of the London Police, the whole system of which, and the conduct of the force, he warmly applauds. An extract from his work on this head will not be uninteresting.

"I was (he says) witness of a great fire of a warehouse, containing more than one and a quarter million of francs worth of wool, near Finsbury Circus, in the City, on a night of the month of October last. Scarcely had the fire been discovered when the first safety machine was already placed at the building, and the first fire engine, with all the speed of the horses, arrived there. In a few minutes they opened the water plugs, adjusted the hoses, and launched the water on the fire at the command of the sub-officer. Then arrived in succession many other engines and fire escapes, and in less than a quarter of an hour the burning warehouse was covered with water, thrown up as well from the street as from buckets carried to the top of the ladders. Although this building was connected with other warehouses of other kinds, and about twelve dwelling houses, the fire was so well concentrated that the adjoining buildings were but slightly damaged. It was at this fire that I was enabled fully to appreciate the strict organization and the duties of each of the three forces. The police, to the number of more than one hundred, commanded by a chief, occupied themselves exclusively in keeping order. They formed in an instant round the workers a ring, which could not be forced, and at such a distance that the voice of the commander could be easily heard. The police did not interfere at all in the works of the fire. Their mission was to maintain order, and to watch the spectators; to act so that the engines and ladders should have full liberty for their operations. On the other hand, except for working at the pumps or to assist in removing furniture, if that were necessary, no one was admitted to the works of the fire. When the ladders have no one to save, they remain on the spot to facilitate the access to the burning buildings. There results, in consequence, from this division of labour, an immense advantage. To restrain the spectators, whose eagerness and cries create disorder and distraction, and paralyse all the officers, is the duty of the police. It leaves to the firemen and the conductors of the safety ladders every freedom for their action, every facility in their movements. In short, every one acts with calmness, intelligence, and remarkable devotion to his duty."

The ninth and closing chapter is upon various subjects.

First, the improvement of the sanatory condition of dwellings, of which the drainage forms a subject of close inquiry and of very minute and lengthened details. The inscription of the names of streets does not escape this Architect's attention, and he particularly notices the enamelled porcelain lettering fixed into a metal frame.

The extensive use of zinc in the present day attracts his attention, and he points out the difficulties to be guarded against in the use of this metal on account of its expansion and conratction under different temperatures.

The subject of zinc is doubtless a familiar one to him from his acquaintance with the large works of that metal near Liége.

The object of calling attention to this work of the Architect of the City of Liége is not so much on account of any novelty of information it contains, because, in fact, the whole of the particulars he gives appears to have been supplied to him fully and liberally by the different architects, engineers, and officers, in London, connected with the Water Companies, the Commissioners of Sewers, and other bodies, and they are known to many, and might be known by all; but to show what appears to me a very systematic report upon the various works of a sanatory and useful nature in a great city; and in a comparatively small space it does, in fact, satisfy the mission upon which M. Rémont was sent. How far the authorities of Liége have benefited their city by the information so largely given is not stated, but every traveller will admit that Liége is far from being a model town in any one of the points which are so fully reported upon and practically illustrated by M. Rémont.

A FEW REMARKS ON ITALIAN ARCHITECTURE.

By the Rev. J. L. Petit, M.A., Hon. Member.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, June 4th, 1855.

It is not to be expected that the observations of a mere amateur like myself will convey any fresh information to practical and professional architects; yet if I honestly record my own impressions, and do not merely retail the opinions of others, I may succeed in suggesting a new, and perhaps not unprofitable train of ideas even to the most experienced.

I have no doubt that much which has appeared to me new and remarkable is, to most of you, familiar and common-place; and that the views which I have entertained and which I would lay before you, are not presented to your notice for the first time; nor need I say that I avail myself freely of the works of other writers upon architecture; that I have been led by them to observations I should probably never have made of myself, and of course must be indebted to them for rudimentary principles, facts, data, historical evidences, &c. without end; still I shall draw my conclusions myself, and not take them ready-made from any authority at hand.

I much regret that I was not present at the last Meeting of this Institute, to hear Mr. Hayward's very interesting paper on Romanesque, of which I have just read the substance in your last Report. Had I met with it earlier, I should probably have framed my present remarks not without some reference to it.

When I express a doubt whether the present attempt to revive the Mediæval styles be favorable to the promotion of architectural taste, or to the advancement of architectural art, I trust I shall not be accused of insensibility to the wonderful beauty of Gothic architecture, nor yet of indifference to the merit of a considerable number of modern buildings of that style, some of which I have had an opportunity of studying lately, and cannot but admit the excellence of their design and execution. In some, the architect has not only traced the details, but caught much of the spirit and character of the age from which he has borrowed his style. At the same time, I cannot look at such works in any other light than as spirited and successful imitations. Their excellence appears to be just proportioned to the closeness of the imitation. I am occasionally told that the advocates of revived Gothic look to, and aim at, a fuller development of the system. If it be so, and if they have a fair prospect of success, my argument falls to the ground; but I do not see any symptoms of this development; any aiming at a higher standard than has already been attained. And under such circumstances, it cannot, as a national style, possess that vigour and energy which are the very essence of true Gothic. I am hardly prepared to admit that the Gothic style was the natural and inevitable result of the arcuated system. It seems more correct to say that it was struck out of it by the genius of a peculiar race, who in other respects are remarkable for their influence on the destinies and condition of the greater part of Europe. But for the Normans the use of the arch, even of the pointed arch, would never have given birth to such productions as Amiens, Strasburg and Salisbury.

I need not remind you that an arch may have two kinds of abutment—one, a solid, immoveable mass, which would stand independently, though the arch were taken away. The other, an arch, or portion of an arch, pressing against that to be sustained, and if the latter were removed, liable to fall in. This constitutes the grand distinction between the Gothic and Roman. For though but a small proportion of Gothic buttresses are actually flying buttresses, that would fall in if the arch strengthened by them were removed, still all the buttresses have apparently that tendency, and are made to indicate an active pressure, while the Roman abutment is a solid vertical mass; (each pier is itself an abutment); and to give a greater appearance of stability, an engaged column or pilaster is attached to the pier, and an entablature carried along the top of the order; broken or not by projections corresponding with the columns. Undoubtedly this is an incongruity in composition, but it may be less severely condemned on account of the expression it gives of repose and tranquillity; an expression, you will observe, proper to architecture itself, independently of the spirit and character of the age or people. And although it is most strongly marked in ancient work, it is by no means lost in the lighter compositions of the revival. The Gothic expression is that of movement, energy, conflict; elements of grandeur, so long as they represent a corresponding spirit of the age, and giving amazing life and force to an architecture that sprung up in times characterised not only by earnestness and strength of purpose, but also by a considerable degree of restlessness, turbulence and violence. The attempt to adapt it to an age of advanced civilization and refinement may possibly result in burlesque, and almost certainly will result in tameness and insipidity. A style suggesting repose (and this also is an element of grandeur) cannot be out of place at any time, or with any people, because it belongs essentially to architecture itself; a style suggesting movement and conflict (which are not the natural characteristics of architecture in the abstract) must be out of place unless it conveys a true and lively expression of the spirit in which it originates And this appears to me the principal reason why modern Gothic buildings fail to command that amount of interest, which the intrinsic beauty of the style, and in many cases the excellence of the work itself, would seem calculated to excite.

Though I have remarked that something may be said in justification of one of the most manifest inconsistencies of the Italian classical style, I by no means assert that we should not get rid of it if we can; and I am farther still from defending the debasements which undoubtedly have tended to bring this style into contempt. That much poverty of invention, meagreness of design, ill conceived and unmeaning ornament have marked some of its stages, it is impossible to deny. In a hasty excursion that I lately made through some parts of Italy, it struck me that works of the revived classical of the 15th century were of great interest; those of the 16th mostly worth study; those of the 17th of comparatively little value, while in the 18th a decided improvement took place, though not without considerable coldness and formality of character. The principal front of the Lateran will explain what I mean. In France and Germany, we shall hardly find buildings of the same purity with those of Italy belonging to the 16th century; but in those countries, as in England, the lingering of the Gothic element gives a degree of picturesqueness to structures very faulty in their design. Of some of the earlier specimens in Italy I will speak presently.

If we must necessarily consider the pointed arch as a refinement and improvement upon the round arch, then it would be a barbarism to go back to the latter. But I do not think we are at all bound to admit this. The pointed arch may in some positions be more appropriate; but it is by no means beyond dispute the better form of the two in the abstract, either as regards beauty or strength. The variety which the pointed arch admits has been much insisted upon. But the variety of angles made by the points of the arches is, I think, the last thing to which we should attribute the beauty of a Gothic cathedral. And though in a recessed pointed doorway every order has a different form, still I think many will prefer the majestic sweep of the round arch of many orders (all of the same form), as it appears at Tewkesbury and Tutbury. It seems not very easy to prove that the pointed arch is invariably stronger than the round. Certainly, in engineering works, the number of pointed bears no proportion to the number of round arches. There are many beautiful Mediæval bridges which present the latter form. That of Kirby Lonsdale for instance; and on the continent the fine Pont St. Esprit over the Rhone, and the ruined bridge at Avignon. To find out the strongest form of an arch must be an extremely difficult problem; for its conditions will vary according to the supposed action of the weight supported; that is, whether we consider it as a solid mass, or as one acting like a fluid perpendicularly to the curve of the arch, or as a number of detached columns bearing vertically upon every point. I suppose the real action is a combination of all three; and I cannot see how mathematical calculation can give any decided practical rule. Probably, in most cases, neither the pointed arch, nor the unbroken circular arc, is really the strongest, but something rather of the form of the parabola, or the catenary, which the curve most commonly used for tunnels appears to resemble. I can conceive the pointed arch to be the strongest only where there is a decided weight upon the vertex, such as a pinnacle; and I should even doubt whether a gable required in the arch below more than a maximum of curvature, not amounting to a curvature greater than any that can be assigned, or in other words, a finite angle.

But experience teaches us that there are few cases in which we may not use the round or the pointed arch at pleasure, either being amply sufficient for the purpose required. The construction of several of our old market houses (that of Ross you may remember as an example), shews that arcades of round arches supporting a considerable weight, can be used with very little abutment. If then, the pointed arch is not a more pleasing form in the abstract than the round arch, not more desirable as a general rule, on the ground of strength, there is no reason why its introduction, at whatever period, should drive the round arch out of the field, or render its adoption obsolete and barbarous. The pointed arch was necessary for the perfection of a particular style, namely the Gothic; but is it impossible that a perfect round-arched style should be developed, possessing quite as high architectural qualities, and equally capable of expressing the genius and character of a people? There seems to me to be greater room for the further development of a round-arched style, than there is at present for that of a pointed style; for no round arched style has been hitherto carried out with that purity, or to that perfection, which almost every remnant of it suggests as attainable. The Roman style admitted the trabeal element much too freely. The Basilican, though purer and not unimpressive, is somewhat meagre, and depends more on pictorial than architectural ornament. The Byzantine promises well, and would form an admirable groundwork. The Pisan, with its multitude of small arcades, betrays a want of architectural invention (I do not say a want of invention in carving and coloured decorations, but I wish to speak of architecture as much as possible independently of other arts). The Lombard is grand but rude. The French and German Romanesque have much that is excellent, and in the 12th century shewed a considerable degree of refinement. The Norman, on either side of the Channel, is a noble and powerful style, but has so much of the Gothic element that its progress could only lead to the Gothic itself. A great deal already exists that might be available towards such a style, supposing it to be a desideratum; and if we followed it up with energy, it is not impossible that some hitherto unknown element, necessary to give unity, individuality, and decided character, may yet be discovered. I believe I am now and then accused of advocating some unaccountable jumble of styles, made up of Romanesque, debased Gothic, Cinque Cento, and Roman, and revived Italian of every class. Now, I would answer, that there is a great difference between obtaining suggestions from these, or fifty others, and mixing up their characteristics. For what I want to draw from these suggestions, are true and essential architectural principles, and not the mannerisms of style. I do not want the result to remind you of Romanesque, or Gothic, or Italian, any further than by possessing abstract architectural merits belonging to each or all. And the careful study of them will enable us to distinguish between sound principles and SUPERFICIAL distinctions.

I will now call your attention to a few of the earlier buildings of the revival which have struck me. The cathedral of Rimini, the latest part of which belongs to the fifteenth century, is well known to you by Mr. Gally Knight's work on the ancient architecture of Italy. The church is Gothic, but attached to its outer wall, is an arcade of round classical arches on square piers. The front, which is unfinished, suggests a very grand design. In this, the ornamental system of the engaged column and entablature is used, but the arcade round the rest of the church is without it, and exhibits in fact the round arch in its purity. I do not think I am acquainted with a grander specimen of the revived classical, as far as it goes; but these arches were built for a particular purpose, namely, to form a canopy for tombs ranged along a rich basement, and the structure would not sufficiently help an architect who is designing a cathedral.

When I was taking notes of the church of S. Paterniano, at Fano, between Ancona and Rimini, I was under the impression that it was a Romanesque building very slightly modernized; the strings round the pier at the spring of the arch, being the only features, if I recollect, by which I could detect revived Italian. Had I examined the exterior first (in an Italian town you often go into a church without a notion of what it is like externally), I should have come to what I take to be the right conclusion; namely, that the whole building is a work of the earliest revival, and one of great purity, but on the whole rather plain. The square central tower masks a dome upon Byzantine pendentives. The nave, transepts and choir, have cylindrical vaults with wide ribs at intervals. The choir ends in a polygonal apse, with a semi-domical roof. The aisles have a series of domes on pendentives, the compartments being divided by broad arches of a single square order. I have no recollection of any system of pilasters or engaged columns with entablature; at all events, none takes any prominent part; and the whole composition might easily be pronounced Romanesque. This is a fine church, and well deserves attention.

There is a little church on the top of a rock at Amalfi, which may be either Romanesque or revival; I have no notion which. I am inclined to guess the former, but only because the west front is not of the usual type of Italian west fronts of that district. In fact, the work is so plain, that there is nothing to mark a date or architectural style. The aisles have cross vaulting, and are terminated eastward by an apse, as is the main body; they are separated off by plain round arches of one square order with square inposts, having no capital or string. The central part of the church has a cylindrical vault, from which springs a dome on pendentives, resting on the crowns of arches instead of their piers as usual. There is no outer roof, the shell of the vault performing this office.

There is a fine church at Padua, near the railway station, which retains in its east end some Gothic work, but is mostly of revived Italian, no doubt of a very early character, and with somewhat of a Romanesque air in parts. The nave is very wide, and has a cylindrical vault with cells falling into it below the apex. It has no aisles, but a series of apsidal chapels, which shew externally. The dome rises from a square base, from which project pediments on three sides, the nave being the fourth. The projection, however, is hardly sufficient to form regular transepts. The chancel is much lower, and has Gothic work; attached to one side of the chancel is a plain square campanile. The building is on the whole pretty free from classical incongruities (I mean the column and entablature occurring among arches); though the exterior of the nave, struck me as being rather modernized.

S. Giacomo, Bologna, retains more of the original Gothic, having a good front of about the 13th century, but the building owes its present character mainly to alterations of the very early revival. It is by the way worth while to study the brickwork of this church, and to compare that of the Gothic with the later. Here and there it is difficult to distinguish the two; but generally, there is a closeness, clearness, almost a polish, in the earlier material, which marks its superior quality. And it will probably be found to be a good criterion of date, where architectural marks are uncertain.

But it is with the revival work we have now to do. The nave is without aisles, but has internal buttresses, which give space for side chapels. It is divided into three compartments, each of which is covered with that kind of dome, which is formed of the same sphere with its pendentives, and of which I have sometimes spoken as the Bernay dome, not being acquainted with its technical name, from its occurrence in the old abbey of that town in Normandy. Eastward of this is an octagonal cupola, the transepts to which do not project beyond the walls of the nave, nor do they make any shew externally. The side wall of the nave exhibits a series of segmental arches, not pointed, of two square orders; some of them contain lancet windows. Above these are four wide round arches, corresponding with the bays of the nave and the cupola. These are moulded, and are manifestly an addition to the original plan. The east end of the church is apsidal with an aisle. The tower attached to the south side is a tall, square campanile in several stages, with round arches. The upper stage seems to belong to the early revival.

St. Sebastian, in Venice, visited on account of the pictures of Paul Veronese, has to the eastward some revival work of a very Byzantine look. It presents a small cupola, nearly swamped by the nave.

In all the examples I have named the architectural style is of great purity, free from incongruities, and of a refinement not found in ordinary Romanesque buildings; adapted also for the introduction of fine sculpture and painting; but without them rather deficient in ornament, and perhaps not suggestive enough of a good system of architectural decoration. I might add some of the examples that more immediately succeeded the classical styles, such as the round church of S. Constance, near Rome, and others of the same description; or even the domical temples of Minerva Medica in Rome, Tussis at Tivoli, Venus at Baiæ, &c., which in their present state exhibit the round arch in its purity.

But an examination of many buildings in which the Italian system of ornamentation is regularly carried out, may furnish us with some excellent ideas as regards composition. The church of S. Giustina at Padua, evidently having for its pattern the neighbouring church of S. Antonio, presents a fine alternation of arch and dome; and in its accessory trabeal system employs the pilaster, always less objectionable in this position than the engaged column. But as a composition I rather prefer the Cathedral of Padua, which has only two domes, separated by a cylindrical vault springing from a mass which contains two arches with pilasters between them, and crowned with an entablature; a similar space intervenes between each dome and the corresponding end of the church. The imposts of the arches are here plain, instead of being, as in S. Giustina, repetitions on a small scale of the large pilasters. The recurrence of fine architectural masses at large intervals, a mode of treatment exquisitely carried out in the model of St. Paul's, appears to great advantage in the church of S. Salvatore in Venice, one of the most striking interiors, after S. Mark's, in that city. Another church in Venice (I understood it was S. Chrysostom) has a square plan comprising a central dome and pendentives, four cylindrical vaults, and four domical compartments at the angles; the central compartment is supported on four not very massive piers; the whole construction being arcuated and domical. Some apsidal and other projections give additional variety to the interior, which is an extremely beautiful one.

Palladio's churches in Venice have good outlines, but his fronts are unsatisfactory, and in the interior he is too fond of the engaged column. His general proportions, however, are very pleasing.

A careful study of the early works of the revival is calculated, you will readily admit, to enable us to clear the Italian style of all that is really base and meagre, and render it a style in which a great architect may express his thoughts, without the fear of being ashamed of, or much dissatisfied with, his work. But it may prove more difficult to clear it of those elements which, whatever reasons may be produced to justify their introduction, cannot but be felt to be incongruous, and yet to command such means of enrichment as are necessary to ensure the magnificence of which architecture ought always to be capable.

A Gothic structure may be rich and magnificent by the mere help of mouldings, without the introduction of any sculpture, even so much as a wreath of conventional foliage. Some of our Cistertian abbeys illustrate this. And the Temple of Pæstum, now denuded of all adventitious ornament, and probably never enriched with much sculpture, proves that Greek architecture is in itself, even without the aid of any other art, sufficient for works of the highest grandeur of effect. Nor is the Roman style, whether ancient or revived, dependent upon sculpture or painting for its magnificence and beauty; and I have purposely selected examples which owe their excellence to neither.

If we attempt any new style we must take care that it be equally independent, though at the same time equally able to avail itself of the highest efforts of the sister arts. So that a mere surface decoration of sculpture does not solve the problem. And the use of unmeaning lines or mouldings to fill up blank space would be a sad falling off from the nervous and powerfully expressive Gothic.

It strikes me that the clear, delicate line of a semicircular arch requires a rectangular edge to mark it out properly, and consequently that it never appears to greater advantage than in plain square orders. A large torus confuses the outline, nor does a chamfer preserve it with sufficient distinctness. A sharp edge, or at the most a small bead, seems to be the proper finish.

If the soffit is full of mouldings, it takes the nature of Gothic; and any other ornament that varies the surface, such as the octagonal pannels in a Roman vault, is objectional as interfering with the strength and solidity of the voussoirs, which require that the inner surface of arch, vault, or dome, be unbroken.

As the arch is a constructive feature, invented for the purpose of bridging over spaces beyond the reach of a stone lintel, or where such could not be conveniently obtained or applied, I might suggest that it should not be used on a minute scale, where a piece of stone, or even a brick, is sufficient to serve the purpose; nor am I certain that the use of small ornamental arcades should be advocated. There is a difference between making the accessory details harmonise with the construction, and making them repeat it. I would suggest that the use of the shaft or column be abandoned, except where it can be perfectly insulated, and of something like classical form and proportion. Vertical lines may be obtained by pilasters, and these can be enriched by fluting, as in the Cathedral of Autun, a building which, though its pier arches are pointed, furnishes many admirable hints for the formation of a round arched style.

If the entablature be recognised, it ought, I think, to be somewhat modified, and confined to two members only, under the spring of a barrel vault; the architrave seems unnecessary except to connect a series of columns.

There is also a test which the composition ought to bear, which I shall call the test of reduplication, and endeavour to explain it. Set a spire upon a tower, and put a pinnacle upon each angle, also terminating with a spire. This may in its turn be surrounded with similar pinnacles, and so on without limit. Your work might soon become too minute to be carried on; but still it would involve no absurdity or impropriety; the original design bears the test of reduplication; we cannot object to it as either involving or suggesting any architectural anomaly.

So again, upon a mass pierced with one arch place one pierced with two similar arches, their imposts bearing the same ratio to the void spaces as in the composition below. On this again place a series of four arches; above that of eight, and so on. You may, as before, soon stop from the minuteness of your work; but carry on your structure as you will, it involves no architectural anomaly; and a design suggesting such repetition or reduplication is in this respect not faulty. But now take an arch with square* imposts; pierce these imposts with arches; the imposts of them also with others, and so on, then we find that we are constantly lightening and weakening the substructure of a heavy mass; and the work that suggests this reduplication does suggest an architectural anomaly, and is therefore faulty.

The arch of Titus or Trajan, with its unpierced imposts, suggests no such reduplication, and consequently is so far correct; but where the impost (stripped of its columnar features) is pierced, the reduplication is commenced; and unless there are points of difference sufficient to turn the mind from the idea that it may possibly be continued, I think the arrangement is faulty. Perhaps the pierced piers of Perigeux are almost open to this objection, unless there be marked with sufficient clearness the difference between the soffit of an arch, and the surface of a vaulted roof. In the model of St. Paul's, the piers are not pierced, but merely hollowed out into a niche; a distinction quite sufficient to avoid the suggestion of any erroneous principle.

You will say that I am only raising difficulties to the formation of the style I would recommend. Perhaps it is so. I feel I am addressing persons more likely to be urged on by the knowledge that there are difficulties in their way, than by an assurance that all before them is plain and easy. It is the province of genius to surmount difficulties. An art beset by no difficulties is no art at all; or at least not one worth attaining. Poonah-painting has fallen into disuse. Potichomanie will, if I am a true prophet, scarcely outlast the present century; and such architecture as consists in mere imitation, whether its model be Gothic or classic, may not be destined to boast a much longer period of endurance. It is not from a mere desire of novelty that I am anxious to see a new style attempted. The Gothic, admirable as it is, appears to be so essentially connected with the spirit and character of the age which produced it, and to owe so much of its value and interest to the expression of that spirit, that its general revival in a different age, notwithstanding its successful adoption by individuals, seems to be morally impossible.

The classical, though not open to the same objection, and having many excellences, still contains certain essential defects and incongruities which prevent our remaining perfectly satisfied with it. A mere recurrence to English or French Romanesque, or a reproduction of German or Lombardic forms, would be an outrage to art herself, who demands constant progress even if it be towards decline, and if she collects the elements of an earlier period, still moulds them into something new and striking.

And therefore I believe that a path is still open to inventive genius, and however I may have failed in finding it out, I cannot be wrong in endeavouring to urge others to persevere in the search.

Mr. G. R. Burnell, Visitor, expressed his high estimation of the value of Mr. Petit's paper, especially in regard to the ideas which it necessarily gave rise to. Perhaps the most fruitful portion of that gentleman's remarks were those relating to the recent mania for reviving mediæval architecture. It had been observed by a celebrated French philosopher (M. Cousin), that the revival of a past style of architecture was in itself an anachronism, and a step backward. Beautiful as the Gothic style was, as a fine and noble exponent of the tone and feeling of that epoch, it was not adapted to the stiff and formal notions of the present day, which had nothing picturesque in its aspect or associations. Besides the evil of becoming enslaved to a mode of thought which was not that of the present age, the habit of blindly copying a previous style was open to the objection that the sam circumstances which led to its adoption as the "fashion" of the day, would lead to the adoption of some other "fashion" which would supersede it. Thus he himself remembered the last glimmerings of the style of the Adams; then the mania for Grecian art; and now the Mediæval mania was predominant. Victor Hugo had said in one of his novels, that the feelings of a nation might be detected by a person who knew how to observe properly the handle of a door. That remark however would hardly apply to this country, where we had Grecian post-offices and Gothic churches,—neither being in consonance with our national habits. The most recent street architecture of the city of London, as exemplified in New Cannon Street, shewed a remarkable improvement upon King William Street. In the latter, the style adopted under the management of Government was bald and tame; but in New Cannon Street the architects employed had displayed considerable invention and talent, and the general effect of that street was very good,—although perhaps some fault might be found with every house. With regard to the use of different kinds of arches for different purposes, Mr. Burnell observed that the round arch was preferred by engineers, because all the voussoirs could be cut from the same mould, and because it admitted of the employment of materials of the same uniform character—such as brick. The parabolic arch had been used with great success in the aqueduct of Lisbon, erected at the beginning of the last century by a Portuguese engineer, but generally attributed to the Romans. With regard to the reduplication theory it was not yet fairly before the Institute, and therefore no decided opinion could be expressed upon it.

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* Piers.

The Rev. Mr. Petit further explained his views on this point. Wherever the reduplication suggested a system which might lead to an absurdity, the composition was faulty.

Mr. Burnell then observed, in relation to the mural decorations of the churches of Pisa, &c. referred to by Mr. Petit, that architectural historians had not sufficiently called attention to the causes which had led to the architectural peculiarities of different countries. For instance, the course of each river in France was marked by a different variety of the national architecture—the buildings on the Loire and the Saone being respectively different from those on the Seine and the Oise. Again, fiscal regulations had a special influence on architecture. At one period a duty was levied on all stone quarried; and hence, even in stone-producing district, as at Caen and elsewhere, the houses of that period were built of wood. The case of the Mansard Roof, referred to at a recent meeting, was another instance of a novelty introduced in consequence of a municipal regulation of the city of Paris.

Mr. I'Anson, Fellow, was of opinion that no single individual had ever invented a style of architecture, and that no suggestions which might be offered could induce the creation of a new style, either from the round arch or the pointed arch. In past times it had required centuries for the perfection of a new style. He did not remember the passage in Victor Hugo referred to by Mr. Burnell, but in the beginning of "the Hunchback of Notre Dame," that author had observed that "in the style and form of its architecture might be recognised the spirit of a people." He (Mr. I'Anson) believed that to be the fact, and that whilst we were now copying Greek and Gothic indiscriminately, the historian of a century hence might look back and trace the feeling of the age by the different styles which now prevailed. It was an extremely difficult thing to copy even a Gothic building, from the associations arising from the objects daily around us, and from the still lingering traces of other styles as well as of the Greek mania. In spite of themselves the objects they saw around them crept into their productions, aud thus the architecture of the age had a character of its own, which would hereafter betray the feelings and tendencies of the age. We were now as progressive a people as ever, and evinced as much invention and as much anxiety to attain novelty and greatness in art as ever; and he hoped some creditable result might be arrived at.

Mr. T. L. Donaldson, H.S.F.C. observed, that the important and suggestive nature of Mr. Petit's remarks, made it difficult to comment upon them without time for consideration. The tendency of the paper to produce greater freedom from educational prejudices was not one of its least advantages. It was evident that the great secret of the success of the Italian architects was the perfect liberty which they had of making designs, and forming a new style, and introducing any novelties that occurred to them. The school of art in England on the contrary, was much oppressed by the critics, and the Italians might be congratulated that they had not an Ecclesiological Society to cavil at their proceedings. He believed there was a sufficient desire on the part of the architects of England to introduce novelties, but in many cases their employers were not sufficiently advanced to sanction it, and they were accordingly compelled to adhere to routine. He had often experienced this difficulty in endeavouring to break through the trammels of the criticism and bigotry of the present day. The distinction between the pointed and the round arch styles was clear and definite. There was an up-rising principle in the former which carried the idea and imagination upwards far more than in the latter; and these abstract ideas should be borne in mind in considering the impressions produced by buildings of either style. No doubt, the pointed style was easier than the round, in point of construction; and he believed that all styles, from the Egyptian to the Mediæval, had been adopted rather for constructive than for æsthetical reasons. The round arch system prevailed for six or seven centuries, but afterwards a constant progress was to be traced, and there was no marked style which existed for more than a century. A remarkable unity and identity was to be observed in the round arch style throughout Europe; in Spain, in France, in England, in Germany, in Lombardy, and in Byzantium, the elements were the same, the difference being in the ornaments. This identity could hardly be accounted for, except upon the supposition, that there was a brotherhood of Freemasons dispersed all over Europe, possessing the same ideas of art, and the same amount of skill. Municipal regulations also, as Mr. Burnell stated, had affected architecture. The window tax, in its operation in this country, was a familiar proof of the latter fact, and our architecture had been in consequence characterized by the employment of small and mean windows. The duty on bricks and glass, in like manner, had a serious effect on architecture. Freed from the operation of criticism, and municipal regulations, he was satisfied that there was sufficient originality in the British mind to render the buildings of London, in the course of the next half century, such as to be able to compete with those of any other capital in Europe.

The Chairman, Mr. F. C. Penrose, V.P., made some remarks on the great value and importance of Mr. Petit's paper. It was evident that that gentleman rested with the greatest satisfaction on the genius of Alberti, especially as developed in the cathedral of Rimini. The cathedral of Mantua was equally interesting, and indeed all the works of Alberti, displayed a fitness which entitled him to the highest praise. It appeared wonderful indeed, that Alberti should have so far carried out a style, with which so little progress had since been made. The Pisan style appeared to be the weakest of the round arch styles, but it displayed a number of most exquisite details. The re-duplication theory deserved particular attention; beyond which, however, it might be premature to say anything. Mr. Petit had indicated a course of thought and study. The path was open to a new and finer style, and its attainment might be a hope to animate those who did not despair of the age. No style which had obtained life and permanence had sprung from new fangled ideas, but from some previous form. Thus, although the Greek temple had been elevated and refined in form and detail, the form of the original wooden structure which was its type might still be traced in it. All architecture, as Mr. Donaldson observed, had grown out of some constructive considerations, and been modified by climate and municipal regulations. As new materials were introduced, so architecture would be modified. No doubt, the architecture of the present age had its peculiar characteristics; as that at the end of the last century was marked by a degree of exceeding weakness and meanness. When such buildings as St. George's Hall, Liverpool, were erected in England, and when such valuable remarks as those of Mr. Petit were submitted for public discussion, there could be no reason to despair for the prospects of architecture.

A vote of thanks was given unanimously to Mr. Petit, and the meeting adjourned.

AN ENQUIRY AS TO THE METHODS WHICH IT IS MOST ADVISABLE TO ADOPT IN THE METROPOLITAN BUILDINGS BILL FOR REGULATING THE THICKNESS OF WALLS.

By Robert Hesketh, Fellow.

Read at the Intermediate Ordinary General Meeting of the Royal Institute of British Architects, June 11, 1855.

In submitting the following observations I must ask your kind consideration for any shortcomings in the enquiry, arising, in part at least, from the uncertain shape the propositions to be investigated have hitherto taken; but I hope my omissions will be supplied by the science and experience of those I have the honor of addressing.

Together with other district surveyors, I feel deeply anxious that the Bill for the regulation of the Buildings of this vast Metropolis should be efficient, and at the same time acceptable to the respectable part of the public immediately interested in it; and yet from the shape in which it has been brought forward, I entertain great doubts whether it will prove either the one or the other. If not, the officers under the Act will bear, as they now do, the odium as well of its deficiencies as of its oppressive enactments.

These officers have been accused, in high quarters, of neglect and apathy in the discharge of their duties with regard to certain sanitary regulations, and though they have disproved the facts alleged against them, and though, if these facts were admitted, they have clearly pointed out that the law does not enable them to interfere, or even to enter upon premises for the purpose of enquiry, yet the accusation remains recorded against them with the following special recommendation:—"should any amendment of the (Buildings) Act be in contemplation, this general neglect of duty on the part of the surveyors, and this apparent apathy of all concerned in the administration of the measure, with relation to the only provisions of it directly bearing on sanitary matters, ought not to be lost sight of." To any one at all acquainted with the Act, the accusation confutes itself, and I cannot help quoting with gratification one of the resolutions just passed by the Builders' Society, to show that it does not weigh much with them, viz:—"That the duties of the district surveyor could not be as well fulfilled by any but competent professional men, and that the interests of the public could not be protected efficiently by any arrangement which would throw these duties on a less educated class of men."

This is the gratuitous testimony of that class which has most concern in the operation of the Act. Those, on the other hand, who have had the charge of the new Bill, have thoroughly carried out the *former* recommendation; for not one of the officers serving under the present Act has been consulted in the preparation of this measure. The result of this unmerited distrust is, I submit, that we have in the new measure not a reform of what is faulty and oppressive (which is greatly needed), but many totally new regulations subverting even the very things most approved by those who are acquainted with the working of the Act. These are my reasons for seeking this opportunity of entering upon the subject which is amongst the most important to have properly settled, namely, the rules for determining the thickness of the walls of buildings.

The short story of the Bill and its changes on the subject before us, since its first appearance about six weeks ago, seems to me sufficient of itself to occasion some diffidence in the minds of those who do not profess to judge of its scientific and practical merits. It was printed at the end of April, read a second time, and referred to a select committee. Previously, however, to its coming before the committee in the middle of May, all the rules relating to the thickness of walls had been struck out, and new ones *on totally different principles* were substituted, in order to meet the outcry against their being complex, and giving erroneous results. The district surveyors, however, and perhaps others, pointed out to the framers of the Bill, that besides the difficulties of working out such complicated rules, they were seriously defective in many points which they particularized. The consequence was, that before any discussion on them took place in committee, a third edition was printed, in which these defects were thought to be remedied by means of special rules intended to meet the objections. This not being the case in the minds of the objectors, at the request of one of the framers of the measure, I discussed the subject with him, and afterwards with him re-cast the schedule in a new form, to which I at first, though (it appears) in error, thought he agreed. This re-cast was put in by the district surveyors, and is now printed by order of the committee, as well as the framers' schedule, which has now assumed the form of a fourth edition.

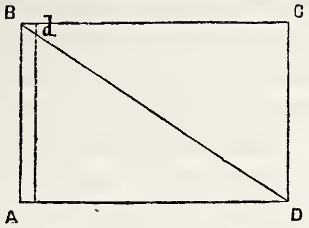
It has, however, been put in by them on the express understanding, that they do not assent to the rules which still remain for determining the thickness of walls of public buildings, where any story is more than twenty feet in height. These rules merely remain because under the altered constitution of the Bill they were not able at once, in so short a time as has been allowed them, to propose a substitute. As they stand, the rules cannot work well.

One important improvement however, has, I think, been introduced into this Bill, by allowing Buildings to be built in compartments separated by cross walls, the thickness of the walls being regulated by the size of the compartment, and not of the whole Building, as in the present Act. The advantages of this are, among other things, that it will conduce to economy of space and cost by allowing thinner external and party walls, and to sounder construction and greater stability by encouraging brick internal walls instead of wooden partitions; thereby also causing a great diminution in the risk and extent of fires, and in the end probably to the reduction of premiums of insurance. I may perhaps be allowed to say, that I first suggested this system to Lord Seymour, then first Commissioner of Works, in March, 1851, when I carefully pointed out all its advantages.

These cross walls are to be at least two-thirds of the thickness required for external and party walls, but not less than 8½ inches thick; to have the openings limited to a third of the vertical area in each story, and to be carried up at least two-thirds the height of the building—I think four-fifths would be better.

We come now to the rules proposed by the framers of the Bill for determining the thickness of external and party walls. One professed object of the framers is to simplify the Act by dispensing with the system of *rating* buildings, which was introduced into the first Building Act passed in 1667, the year after the fire of London, and said to have been framed by Sir C. Wren. A diagram on the wall shews the four sorts (or rates) of buildings and the thickness of the walls in that Act. I must here assert, that there is a complete declension from the framers' original intention. In the first Bill, it is true, it was completely carried out, but it was so, by introducing a far more complex system; by losing sight of many matters which past experience had shewn to be proper and requisite; and by permitting many defects and anomalies in practice. These having been pointed out (and I will presently show some which remain after the last revision), a most complex system of rating actually, though not nominally, has been introduced into the new edition. Let me read some of the rules for dwelling houses, S. 4. We have here, besides the general rule, no less than seven special ones according to the seven different sorts (why not call them rates) of walls. Warehouses, and that class of buildings, have likewise another system of rates of walls. And more than this, while the present Act gives but one rate to each building, the Bill would give a separate rate to almost every *wall* of a building. This must then surely negative any advantage said to be gained in this respect, and moreover give the comparative merit of simplicity to the present Act. I am not sure that I might not go one step further, and submit that this complex system of the Bill ought, in this respect alone, to prevent its adoption for ordinary buildings. But, it will probably be said by many, that if the result obtained is right, it will be worth this complex machinery, and into this result we will therefore enquire.

Now, the system proposed in the Bill purports to be founded upon the principles set forth by Rondelet, which he based upon, as he says, "an infinity of experiments, observations, and calculations." His first rule, which is that adopted in the new Bill, with a modification in the denominator, is as follows:—



Let A B C D be the elevation of the wall of a building, between return walls at A B and C D, without any tie or abutment except at its top and base. Draw the diagonal B D, and set off on it B *d* equal to a twelfth part of the height A B, and draw a line through *d* parallel to A B and the space between this line and A B is the required thickness of the wall. The height A B, be it observed, is from the floor to the tie of the roof, not to the top of any parapet or gable as in the Bill. The following formula gives the same result.—The thickness$=\frac{l \times h}{12 \times d,}$ (l, h, and d, being respectively, the length A D, height A B,) and diagonal B D. This, though only a rule of thumb, seems to be founded on some degree of reason; for it is evident that in walls of the same height, the longer a wall is between return walls, the thicker it ought to be within certain limits; nevertheless, the thickness ought not to increase so fast as its length, because the height must be the principal element in determining the thickness. This is attained by the rule where the length is much in excess of the height, inasmuch as, supposing the length to increase from A towards D, and onwards by equal increments, the corresponding increments of the ratio of the height and diagonal would be continuously diminishing. In the same case, the thickness would increase nearly in proportion to the increase of height. But the rule fails more and more as the height becomes more and more in excess of the length, till it gives absurd results, as in the walls of towers.

The formula of Rondelet is as I have said:—

$$\text{The thickness}=\frac{l \times h}{12 \times d}$$

That of the last edition of the bill is for public buildings,

$$\text{The thickness}=\frac{l \times h}{18 \times d}$$

Now my impression is, that the divisor 18 will make the walls too thin for safety when in one story, and that Rondelet's divisor 12 is better. It is, however, a subject which requires great consideration, and I hope some light may be thrown this evening on this point. I give a few examples of calculations on both formulæ, in the diagrams suspended, in which are three instances of the aisle walls of churches with galleries. In these, Rondelet's rule comes nearer than that of the schedule to the actual thickness; but I think that a mean between 12 and 18, will be found better than either for brick walls of public buildings in one height.

The formula ought, as I have shown, to be discontinued when the height is much in excess of the length; otherwise a wall, say 60 feet high and 20 feet long, would have its base no thicker than one 20 feet high and 60 feet long, and the Bill does so when the height exceeds twice the length, by requiring the thickness to be $\frac{1}{40}$th of the height. Yet I think this also gives too slight a wall, and requires the fraction to be increased.

For myself, I certainly think that for public buildings with a high story, a formula ought to be introduced for determining the thickness of the walls, instead of the undigested rule of the present Act, though it may not be applicable on every occasion, and then special calculations must be resorted to. At the same time I think a far more perfect formula may be obtained by varying the thickness with reference both to height and to the square root of the length, which is founded on the reasons I have before given, and would not require abandonment in certain cases, as Rondelet's and the framers' rules do. I venture to submit the following formula therefore for consideration, though it is but a rule of thumb.

$$\text{Thickness in inches} = \frac{2h}{5} + \sqrt{l} \quad (h \text{ and } l \text{ in feet.})$$

Many speak against any such rule as being complicated, but this would not be the case, because of course directly after the Act was passed, tables would be formed just as we now have with reference to bearings of timbers.

But where I venture entirely to differ from the framers of the Bill is in their not limiting this rule to *public buildings where there are lofty stories*, and then only to such *lofty stories themselves.* Rondelet himself, in giving this rule, limits it to *walls in one height without ties or abutments* given to it by intermediate floors or roof. In the case even of the clerestory wall of a basilica he modifies it by setting off on the diagonal, as at B d, $\frac{1}{12}$th of the height of the clerestory added to $\frac{1}{24}$th of that of the part below it; thus diminishing the thickness on account of the aisle roof.

But for buildings composed of many stories he says distinctly, "In ordinary houses where the height of the stories does not exceed 12 to 15 feet, in order to find the thickness of walls, whether internal or external, regard must be had *only to the width of the spaces which they divide, and to the number of stories which they have to sustain.*" It is not however necessary for me, I am glad to say, to go into the rules he gives for these buildings in stories, for this reason, that the framers of the Bill have themselves *unaccountably* forsaken these rules which Rondelet himself prescribes, and have adopted his first rule which I have explained, and which he most distinctly repudiates for ordinary buildings in stories.

The framers' schedule is consequently still full of serious defects and anomalies, notwithstanding that they have departed from their first principle, and have introduced so many special rules for the purpose of obviating (as before-mentioned) some particular inconsistencies in the application of their general rule.

I will point out two or three defects :—

1st. Small houses, now called fourth rates, if they have *four* stories, are to be allowed *two* stories of 8½ in. walls, whereas if they have only *three* stories they are allowed only *one* story of the thinner or 8½ in. walls. This is the reverse of equitable.

2ndly. In the larger description of houses, say there are two walls each 40 feet long between return or cross walls, and suppose one is 75 feet high, the other 85 feet high, the latter may have a greater height of the 13 in. or thinnest wall than the former.

3rdly. In any such buildings any of the uppermost stories, such as may be used as a gallery or show-room, might have been of any height up to about 40 feet, and yet have had the walls only 13 in. thick.

I say, *might have been*, because a new edition of the framers' schedule has just been printed, and is now laid on the table of this Institute for the first time. This, I believe, has taken another amendment from the present Act, by introducing a rule for increasing the thickness of the walls of stories, when above a certain height, beyond the thickness otherwise required.

Now, under the rules of the present Act, I venture to say that not one such palpable defect or inconsistency can occur, but under the framers' schedule there are many more than I have specially mentioned, which I have not had time to put into shape.

There is one great anomaly, I admit, under the present Act, if the official referees, and with them about three of the district surveyors are correct in their view of the Act, which is, that the small buildings commonly built in the rear of larger ones, and communicating with them, should require thicker walls than the larger building, because by the addition of the smaller building the rate of the whole had been increased. This, however, would be completely remedied by the new system of cross walls.

The Bill then, as I have above shown, is inconsistent and erroneous in its practice, and at variance with its own authority, Rondelet, in adopting, in spite of him, his first rule for ordinary buildings in stories, and in forsaking his general principle, that in determining the thickness of the walls of such buildings "regard must be had only to the width of the spaces which they divide, and to the number of stories which they have to sustain." Clearly neither one element nor the other comes into the calculation. I do not say that Rondelet is perfectly right; but at all events he has named two principal elements.

But while the new Bill *does not* recognize these elements, the present Act *does* so, in the case of dwelling houses, by rating them according to area as well as by the height and by the number of stories. In the rating by area, the width of spaces between walls may be deemed to be sufficiently taken into account; for in—

4th rates,	the extreme width is	$\sqrt{400}$—9 inches,	or about	19 ft.,	or in ordinary cases, say	15 ft.
3rd „	„	$\sqrt{600}$—1 ft. 2 in.	„	23 ft.	„	17 ft.
2nd „	„	$\sqrt{1000}$—1 ft. 2 in.	„	30 ft.	„	22 ft.
1st „	„	$\sqrt{1400}$—1 ft. 6 in.	„	36 ft.	„	27 ft.

And to meet these progressive widths are these progressive rates, requiring a progressive increase in the thickness of the walls.

The number of stories also is taken into consideration by the system of determining the thicknesses by reckoning from the top of the wall downwards, instead of, as in the 14th Geo. III. from the base upwards.

I believe, therefore, that for buildings in stories the system (I do not say all the details) of the present Act is as perfect as possible, including in it of course the rules for increasing the thickness of walls of high stories and their sub-structure.

In the re-cast schedule it is therefore proposed to retain the rules of the present Act for the dwelling house class (with the exception of allowing in fourth rate houses only two instead of three stories of the party walls to be built of $8\frac{1}{2}$ thickness, as the latter has been found not to be sufficient for stability), also to retain them for warehouses and manufactories, with slight exceptions. It is further proposed—notwithstanding those general rules, that every story of a dwelling house shall have the thickness of its external and party walls at least $\frac{1}{15}$th of the height of the story, and in warehouses and manufactories $\frac{1}{12}$th of the height; and that any extra thickness may be disposed in piers $\frac{1}{3}$rd the length of the wall, and that any sub-structure shall be increased in the thickness proportionably to the superstructure. Where public buildings are built in stories not exceeding twenty feet in height, it is intended that they shall follow the dwelling house class, where, however, public buildings have any story or stories exceeding the height of twenty feet, then to let them follow the rules of the framers' schedule which, however, I think might be improved by keeping the rule to a single story, and by decreasing the divisors 18 and 40 to numbers nearer to—say 15 and 30.

One other new introduction into this Bill, which I think quite right, and that it will be attended with perfect security, is the allowance of recesses in party walls as well as in external walls.

In conclusion, I wish to state that the remarks which I have ventured to offer have been made with the determination of adhering as far as possible to the Bill before us; because there are doubtless wise reasons for adopting the general scheme of the Bill. But with regard to public buildings, the District Surveyors have long ago urged the value of the superintendence as to their safety being delegated, as at present, to more than one architect. Make what rules you will, it will be found that to the large majority of public buildings—excepting those built in stories—they will be totally inapplicable, in one part proving very obstructive and oppressive, in another insufficient for safety. In the former case the architect must get relief by application, as now proposed, to the Superintending Architect, to whose single decision—perhaps of not equal consideration to his own opinion—he will have to bow. For this object a Board of Architects, as at present constituted, must be far preferable—at all events till the happy time shall come when public buildings shall in all cases require an architect, and an architect in all cases a diploma to show his qualification for his profession—when official supervision, as to safe construction, might be probably dispensed with altogether.

THE CHAIRMAN, Mr. TITE, V.P., M.P., observed that the real matter for discussion was very simple. It had been a great inconvenience that the existing Act, and the Bills as previously printed were indefinite, but the copy of the Bill in its latest form, which he had that day obtained from the office of Woods and Forests had his unqualified approval. It contained a clause suggested by himself to the effect that the Institute might cause to be examined by such persons, and in such manner as they might think fit, all persons who might present themselves to be District Surveyors, and that the Institute should grant certificates of competency, without which no District Surveyor should be appointed. This was a point gained, and more might have been gained if the District Surveyors had acted with the Committee of the Institute. Those gentlemen, however, had acted independently, and had to a certain extent defeated the object of the Institute by interfering and suggesting something altogether different from that which the Committee proposed. Division among the members of a profession, not numerous in themselves, was much to be deprecated; and the sooner it was put an end to the better. With regard to the thickness of walls, he considered it was idle to occupy time in the discussion of formulæ and principles. As a practical architect, he was sure that the regulations laid down in the schedule would in the main break down; but this did not signify, as the bill contained two clauses which, with a little amplification, might have superseded the necessity for the schedules. One of these clauses provided that the Board of Works might alter the rules for the thickness of walls. Therefore if the formulæ suggested, either on one side or the other, did not work well, there was the power to change it, and that power would in fact be in the hands of the architect to be appointed by the Board of Works, who would see the necessity of exercising it. The other clause provided that in the case of "any building whatever except those mentioned in the last preceding section,'' namely, buildings of iron and glass, the builder might either construct the same according to the rules of the Act, or he might represent to the Board of Works the inapplicability of the rules, submitting a plan and particulars, and then the building might be erected in any way which the architect appointed by the Board might direct. To the existing system of "rates" there were some objections, because mathematical rules must be limited, definite, and arbitrary, and they must lead at times to inconvenience; but in the main the schedules of the existing Act were understood and were satisfactory. With regard to the new schedule, he should only be disposed to modify it by making it more technical. There were some excellent points in the Bill, and not the least of them was that questions of difficulty would be handed over to the responsibility of one individual, so that they would know who to blame if he went wrong. With regard to the schedule, it should be remembered that walls were built according to the size of the bricks,—namely, 1 brick, 1½ brick, 2 bricks, &c., in thickness, whereas these thicknesses were expressed in the schedule in *inches*, which no bricklayer or ordinary individual would understand. The framers of the schedule had taken the size of the brick as *exactly* 8½ inches, whereas some were rather more, and even the fraction was not correctly carried out in their measurement of thickness. He would recommend the meeting to take the Bill for the good which was in it. The Legislature could not be expected to go into the abstract questions raised by Mr. Hesketh. The question was whether the meeting wished to retain the present system of rating by area and height, and on this point the Committee of the Institute and the District Surveyors should be unanimous before the Parliamentary Committee. They must either abide by the present system of rating, or take the new schedule for good or for evil, seeing that the Bill contained a remedy in case it did not work well.

Mr. C. Barry, Fellow, suggested that the present system of rating might be retained, together with the improvements introduced by the new Bill.

The Chairman said he had urged upon the Parliamentary Committee the propriety of adopting the new Bill with the *schedules* of the existing Act. That question was reserved by the Committee for consideration, and that was in fact the question for discussion, whether the Institute preferred a schedule which retained the old system of rating, or one which abolished it entirely. The question was limited to the schedule apart from the Bill itself.

Mr. C. Barry. The schedule of the existing Act had been long in use and was intelligible, and probably a majority would decide that it had been found to work sufficiently well, and not to need any important change. The system of rating was thoroughly understood by professional men and intelligent builders, and it would be much better than any complex system such as that now proposed.

Mr. Papworth, Fellow, inquired whether the Committee of the Institute had recommended the system of rating of the old Act or of the existing Act.

The Chairman.—They ended in recommending the system of the present Act, the schedules of which appeared to them, with the aid of the diagrams attached to them, to be perfectly intelligible.

Mr. Papworth then moved—"That the Committee of the Institute be requested to urge respectfully upon the Special Committee of the House of Commons on the Metropolitan Buildings Bill their opinion, that it is not desirable to change the principle of rating of the present Act, and the thickness of the walls consequent thereupon; and that in their judgement it is most desirable to retain the schedules of the existing Act relating to these subjects.'' He had observed many points in the new schedule upon which a difference of opinion might arise, whereas the existing schedule was clear; and if a man engaged to build a house of not less than a particular rate, there could not be any mistake about it.

Mr. C. Barry seconded the motion.

Mr. JENNINGS, Fellow, observed that there was little to complain of in the schedules of the existing Act; the only difficulty as to the thickness of walls being in the case of public buildings, when it was necessary to apply to the Official Referees for a modification. The schedules had worked well, but the other machinery of the Act was defective, and prevented its being carried out. It was now proposed that the Government Official should have power to alter the rules of the Act as he pleased. The propriety of such an arrangement was rather a question for the public than for the profession; but he thought architects would object to be liable to the crotchets of any one individual. When he first saw the present Bill, it appeared to him to affect very much the liberty of the subject; and he regretted that it had not, like previous Bills, been sent to the District Surveyors and the profession generally, in order that they might have an opportunity of stating their objections to it. As far as his own experience went, he thought the existing schedule worked well. With regard to the thickness of walls being defined in inches, he differed with the Chairman. The present size of bricks was not, he thought, the most convenient; and probably perforated bricks of larger size might be used, as they would not be heavier than solid bricks of the present size. The size of bricks not being now fixed by Act of Parliament, alterations might be expected which would render the definition of thickness by the number of inches necessary.

The CHAIRMAN said it was necessary to provide for bonding; and although there might be bond with a ten-inch brick, it was necessary to state that the wall should be one-and-a-half, or two bricks thick. The schedule ought to be so worded as to insure the erection of a wall with bricks that would bond together and make sound work.

Mr. JENNINGS concurred in the importance of the point referred to, but improvements in the manufacture of hollow bricks, &c. should not be impeded.

Mr. PENROSE, V. P., said that having acted somewhat as junior architectural counsel, under well-skilled seniors, in the preparation of the Bill, he could assure the Institute that there had been no intention to avoid bringing the measure earlier before them. The delay had arisen entirely from accidental circumstances. The District Surveyors had been very much consulted, nearly fifty reports, which had been received from them some months ago, having been carefully considered. Lord Seymour's Bill, which had been much used in the preparation of the present, was also based very much upon the evidence of the District Surveyors. The question really was, Rating or no rating? And on this point, the reports of the District Surveyors in many cases raised a doubt whether the existing system was a good one. It had not appeared right to the framers of the measure to put *all* buildings, as it were, into five boxes of fixed sizes; but rather that they should consider walls in themselves, and in reference to the work which they had to do. Rondelet, as the great authority on this point, was consulted, and both of his systems were worked out with great care, hundreds of examples being tried. Looking at the proposed schedule in its present form (and disregarding the accident which led to the printing of one system which it was necessary to recall), it was believed that the rules laid down would give the proper thickness of wall in almost every instance; and where it did not, there was a remedy by application to the proper authority. The existing rules for rating, it was true, might be understood after some consideration; but in many cases great inconvenience was felt in carrying them out. Perhaps a design for a building might exceed ten squares by a few feet only; and then, to avoid going to the expense of a first-rate structure, great difficulty and trouble were incurred in order to get it into the second-rate box. In the country, beyond the limits of the Building Act, walls were considered by themselves, and it would be thought a hardship to regulate their thickness by the area of the building. Mr. Penrose referred to the schedule and the table showing the thickness of walls of different heights, in order to show the facility with which it might be applied. He also referred to diagrams to show the working of the new system, the general effect of which, he stated, would be to modify the somewhat too great safety of the present walls, and thereby to give an advantage to the builder and to the public, at the same time insuring in all cases an adequate degree of strength. He knew it was the opinion of many besides himself that the system of rating was inconvenient, and that a simple rule for determining the thickness of walls by themselves was preferable. The general rule proposed, and which would apply in nine cases out of ten, was that when the length of a wall did not exceed half its height, then its thickness should be $\frac{1}{50}$th of its height; and where this was the case, the simplicity of the rule would supersede any reference to the tables: and even in other cases such reference would be very easy, as the tables were short, and might be carried on a slip of paper in a pocket-book.

Mr. JENNINGS inquired if the Bill provided for the intended height of a wall being ascertained before its erection.

Mr. PENROSE said it did. By the tone of the remarks which had been made, he felt sure that they had met together to help the measure where it was good, and to improve it by criticism where it might be defective.

Mr. PAPWORTH raised an objection to the working of the table in the schedule in a suppositious case, which—

Mr. PENROSE regarded as exceptional, and one which was very unlikely to occur; observing that it was impossible to legislate for exceptional cases, and referring again to the power of alteration vested in the architect to the Board of Works.

Mr. JENNINGS inquired if the new Bill would allow a wall to be filled with flues as at present, thereby reducing its thickness to a few inches. He also made an inquiry respecting corbelling over.

Mr. PENROSE said that the recesses allowed in the Bill would leave the piers more solid, and the evil referred to was therefore not likely to occur. Corbelling would be limited to the thickness of the wall corbelled.

Mr. G. R. BURNELL, C. E., considered the power of altering the rules of the Act objectionable, as the principle of all law was its certainty. It was, in fact, absurd in logic to make enactments, and to give the power to vary them; especially as that power would be vested in one individual, no express provision being made for his capacity or professional position, although, of course, the Government would not venture to appoint a person who was not duly qualified. The proposed schedule, like all former schedules, was defective, as it did not embrace buildings having roofs of large span at considerable heights, such as railway stations.

Mr. PENROSE said all railway buildings were excepted.

Mr. BURNELL,—Why should they be excepted?

The CHAIRMAN observed that the dispensing power, or the power of the keys, to loose or bind the rules of the Act, had been definitively settled by the Committee, and it was therefore useless to discuss it; and with regard to railway buildings, the Chief Commissioner of Works well knew that if he attempted to include them in the Act, he would raise a storm which would be irresistible. The discussion had better be confined to the question of rating or no rating.

Mr. BURNELL said that as far as dwelling houses were concerned, he did not see any necessity for altering the old schedules; the difficulty only arose with reference to public buildings. Mr. Burnell then referred to the Strasburg Railway Station at Paris, 500 feet × 100 feet, and 45 feet high) the walls of which were only 1 ft. 10 in. thick, whereas, according to the formula of Rondelet, and the proposed schedule, they ought to have been 3 ft. 7½ in. if without buttresses, or 2 ft. 5 in.

with buttresses. Mr. Burnell also cited a polygonal engine shed at Tours, of which the dimensions were as follows:—radius of the circle, 66 ft. 6 in.—span of roof bearing on the external walls and on internal columns, 33 ft. 3 in.—sides of polygon 25 ft. 7 in.—the thickness of the wall being 2 feet. This thickness coincided with the formula of the Rondelet, but according to the schedule in the first edition of the Bill under discussion, the thickness need not have been more than 10 inches. Mr. Burnell stated that in his opinion Rondelet had not been sufficiently studied on this point. He concluded his remarks by handing in a statement of the thicknesses of walls used in Paris, in accordance with law and custom, translated from Claudel's "formulæ and aide memoire for architects," and given in English measures.

The Chairman read the statement handed in, observing that it would not apply to English practice, where the materials used were different.

Mr. C. Barry urged in favor of the existing system of rating the facility with which the rate could be determined by the area set out; whereas the height of a wall (the new element proposed) could not be ascertained till its completion. The power of deviating from the rules of the Act might, it appeared, be obtained by applying to the Board of Works, but experience proved that owing to the multiplicity of business before them, an immediate answer to such applications could not be expected, and that, on the contrary, the answer might be delayed for six or even twelve months. The interests of the parties would consequently suffer most cruelly, and practically they would go on in defiance of the law, as they did at present. The existing rules for rating applied exceedingly well to all ordinary buildings, and when a building was of extraordinary size and importance, a far better guarantee than the rules of any Act of Parliament would be afforded by the reputation of the architect or engineer employed. Competent men were always employed in such buildings, and their reputation was involved in the stability of the structure. The Act should be so framed as to control the speculative builder, who merely sought to make money and build cheaply, and who had no reputation to lose.

Mr. Ald. Cubitt, M.P., said that when he was asked by the Chief Commissioner of Works to act on the Committee on the Bill, he had felt it his duty to consent. He, in the first instance, carefully read the Bill, and was much struck with its merit as introducing a system of extreme simplicity with regard to the thickness of walls; and he was still of opinion that it was more rational to take the height of each individual wall, and to consider its requirements in reference to its height, rather than with reference to the area of the building. He was the more convinced of that by considering the anomalies of the existing law. If a building contained four squares, it was a fourth-rate building, and if it contained more, the walls must be of a greater thickness. But as a building of four squares would not accommodate two families, an "addition" was made to it, the walls of which were allowed to be of the same thickness as those of the building itself. Therefore the law sanctioned that as an evasion which the proposed new system would permit. Moreover, the evasion gave more trouble to the District Surveyor, and the house costs more by reason of the delay for the "addition," and must be let at a higher rent. There was no necessity for adhering to the old law, and although the system of rating might afford some facilities in letting land for building a particular rate of houses, there would be no difficulty on the new system, but what the Surveyor and Solicitor of any estate could readily overcome. There was nothing indeed to recommend the existing system, except that architects were accustomed to it, and had been brought up in it. He had been a builder 40 years, and ought to have obtained a great deal of experience; and if he were still a builder, he was satisfied that by inspecting the drawings, and ascertaining the length and height of a wall, he should at once be able to determine its proper thickness under the proposed schedule; and the District Surveyors would in like manner find no difficulty in it whatever. He had often had to deplore the necessity of making a wall of an unnecessary thickness, because the building happened to be of a certain rate. The present was an age of reform, in which it would not do to uphold a system because it was old and well understood. On the contrary, all reformers would join in any well digested scheme by which the construction of houses could be made better and cheaper, and by which all unnecessary machinery could be got rid of. They were now 200 years in advance of Sir Christopher Wren, and it was strange indeed if they could not improve upon a system which was probably the best which could then be suggested. He was gratified by the honor of being invited to attend the present meeting, and felt sure that the Institute would look rather to the interests of the public than to those of a class.

Mr. T. Piper, Visitor, expressed his opinion, that the schedule to the Bill, as that day printed, would be acceptable to builders. The rule of determining the thickness of a wall by its other dimensions must commend itself to all as a simple and practical rule, and far preferable to that of the area which it might enclose. It would be very easy to fix the limit of height before a building was commenced. As an illustration of the difficulty to be expected in applying for any departure from the Act, Mr. Piper stated, that on one occasion he had received permission to erect a house, just four weeks after it was finished and occupied; but even this difficulty might be met if the time was defined. (The Chairman said, that point had been absolutely settled by the Committee.) Mr. Piper added, that as a builder, he had been quite alarmed by the elaborate mathematical formulæ which had been displayed in the course of the discussion. They only wanted a simple application of plain rules, such as they could all understand. The result of experience shewed, that out of 100 buildings in London, 52 were of the fourth rate, 27 of the third rate, 14 of the second, and only 7 of the first rate; therefore, so much profound science was not generally required. He preferred the definition of the thickness of walls by inches rather than the number of bricks; for with all the prejudice of education in favor of the existing size of bricks, he was not prepared to say there might not be changes and improvements in bricks hereafter. He regretted that the Bill had not been made sufficiently simple in all its provisions, to apply not only to the metropolis, but to all large towns. The schedule, in its amended form, would practically have the effect of permitting very much such houses as they were accustomed to build, whilst it would proceed upon a principle which all could understand, namely, that of making a wall do its duty as a wall, without reference to any other part of the house.

(Some discussion ensued between Mr. Jennings, Mr. Hesketh, and Mr. Alderman Cubitt, in reference to the case put by the latter as to an "addition" to a fourth-rate building).

Mr. Hesketh said, that with regard to first and second class buildings, he approved of the existing system, with one or two very slight modifications. The present Act was indeed founded upon Rondelet, and carried out his views better than the new Bill. As the Institute of British Architects, and aided by the advice of the most eminent builders, they ought now to determine which was the best system.

The Chairman observed, that the Bill was expressly intended for the metropolis, and therefore the argument of Mr. Penrose, as to what would be done in erecting a house in the country, would not apply to the present case. With regard to the proposed schedule, the inconvenience which would arise from its concluding in one case at thirty feet, would be as great as the inconvenience pointed out by Mr. Penrose in the system of *rates*. The great object was to protect the interests of the public as against the interests of speculative builders. Reform should be carried out, but they must not introduce confusion. The present system was well understood, and was working well; and why, therefore, should it be changed? The technical phraseology of the schedules ["Let a right angled triangle," &c. &c.

&c.], was enough to confound a plain man before he got half way through them. They were not dealing with cases where architects were employed;—for even in the highest possible quarters, it was not now the fashion to employ scientific men. Mr. Cubitt and Mr. Piper had shewn the anomalies of the present Act, and he trusted the new Bill, as distinct from the schedules, would remove the unworkable machinery and simplify the law. Under the existing system, he had found it necessary to persevere with works which he knew to be morally and scientifically right, in defiance of the district surveyors and official referees. This state of things, however, ought to be reformed, but not by introducing confusion. If walls were only to be regarded with reference to their dimensions, people would forget that their real object was to enclose areas, and to carry floors and roofs; and for these reasons, he considered the system of rating to be a natural and proper rule. He had opposed, and should continue to oppose the change of the law as to walls. The Chairman then called attention to the terms of Mr. Papworth's motion.

Mr. **Hesketh** proposed to move as an amendment, "That public buildings should be excepted." He thought that public buildings in stories exceeding twenty feet in height, required some special scientific rules for determining the thickness of walls.

After some conversation, the proposed amendment was incorporated with the original motion as follows:—"That the Committee of the Institute be requested to urge respectfully upon the special Committee of the House of Commons on the Metropolitan Buildings Bill, their opinion—that it is not desirable to change the principle of rating of the present Act, and the thickness of the walls consequent thereupon; and that in their judgment it is most desirable to retain the schedules of the existing Act relating to these subjects; except as to the Public Building Class, to which the new schedule may with propriety apply."

The motion being put to the vote of the Fellows present, was carried, Mr. Penrose alone voting against it.

A vote of thanks to Mr. Hesketh, was then put and carried unanimously.

Mr. **Hesketh** stated, that the district surveyors had not at all intended to act in opposition to the architects in reference to this Bill, but being so much concerned in the practical and working part of the measure, they had thought it better to withdraw from the Committee of the Institute, leaving the latter to represent the more scientific view of the subject.

The meeting then adjourned.

PRACTICAL OBSERVATIONS ON PILE DRIVING.

By G. R. Burnell, C.E.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, June 18, 1855.

Piled foundations are most advantageously employed when the solid ground, over which it is proposed to erect any important edifice, is situated at so great a depth from the surface, that the removal of the softer and sometimes unequally compressible intermediate strata would be attended with excessive delay, difficulty, or expense; or when there is any probability that either the intermediate materials, or the substratum on which they rest, may be displaced by land springs forcing their way under the foundations. As these conditions occur most frequently in hydraulic engineering, and I have had some practical experience in works of this description, it may afford a subject of interest if I lay before you some observations which I have been led to make during the progress of the various operations which have come under my notice; dwelling principally upon facts, and avoiding as much as possible any purely theoretical, or disputed questions connected with the subject.

Piles are usually formed of round or squared timber, and are driven into the ground in a vertical direction, or in one corresponding with, and parallel to, the resultant of the forces they are intended to resist. Of late years, however, both cast and wrought iron have been used instead of wood, in some situations with remarkable success. But in salt or brackish water, a chemical action upon the metals takes place, which renders their application very questionable, even if it should not be considered to justify their total exclusion in positions of this description, in which engineers are compelled to use wood, notwithstanding the danger to which it is exposed from the attacks of the boring worms.

The kinds of timber most frequently used in England for piles, are beech, elm, Scotch or English larch, Baltic fir, the American rock elm, live oak, the green heart, or the sabacu, from Guiana. The two last named are said to resist the attacks of the borers, but we have hardly sufficient practical experience in this respect to justify implicit belief in their superior value. It is, therefore, very desirable that authentic observations should be made upon their durability in waters where the above-named destructive worms occasion the greatest injury. On the continent, beech timber is principally used for piling, and a prejudice appears to exist against the family of the firs; round timber is also preferred for detached piles to timber which has been tool dressed; indeed, Perronet says expressly, that "such piles ought not to be squared;" but, he adds, "they must be straight in the grain, and without projecting knots." In England, the choice of the particular description of wood appears to be regulated by the nature of the ground into which the piles are to be driven; or by considerations connected with the local markets. Amongst workmen, piles of American wood are generally known by the name of "*hard wood piles*;" and those of European are called "*soft wood piles.*"

The preference of any particular description of wood for pile driving, it appears to me, should depend more upon its durability, and immunity from attack by either organic, or inorganic causes, than upon its original cost. Beech timber decays very rapidly when exposed to alternations of dryness and humidity; elm resists such exposure more satisfactorily; fir, when free from sap, lasts longer still under such circumstances; but, of course, all woods decay with greater or less rapidity in positions where they are exposed to these alternations, and the only methods which appear to have successfully solved the problem of increasing their durability, are those of Kyanizing, or of creosoting. It has been stated, that the injection of the ingredients employed in the application of both these methods, renders the wood sufficiently distasteful to the boring worms, to ensure immunity from their attacks. If this were true, the contingent advantage would, in marine or hydraulic architecture, be equivalent to that gained by the increased durablility of the wood; for the ravages of the borers are sometimes carried on with a rapidity, and to an extent, hardly credible. Little, however, appears to be positively known of the real habits of these destructive animals; but I am disposed to believe that they are most destructive upon limestone, marly, or clayey shores, and least so upon granitic shores. But if the wood employed on a granitic shore should contain any germs of these animals, they would infallibly develope themselves even there. In several cases, I have noticed that the borers do not touch the timbers driven near the outfalls of sewers, although they may be extremely destructive in all other parts of the same port: it would appear that the composition of the waters discharged from the sewers is fatal to them. The whole of this subject, it may be asserted, requires far more elaborate investigation than it has hitherto received from engineers, or architects.

According to their position in a foundation, piles are distinguished by the following names. 1. *Guage piles,* driven to define the limits of the ground to be enclosed, or to act as guides in driving the other piles. 2. *Close piles,* driven between the guage piles, to form a continuous enclosure of wood work. 3. When the close piles, instead of being of the same scantling as the guage piles are only of half timber, they are generally known by the name of *sheet piles.* The several descriptions are connected together by *wales* or horizontal ties; by cross braces; and in some cases by a platform, which is either entirely close, or formed as an open grating. The entry of the piles into the ground is facilitated by their being cut to a sharp pyramidal end, generally shod with iron, either cast or wrought: in sheet piling, however, the various pieces of wood have often a sharp edge, parallel to the face of the enclosure. Wrought iron hoops are generally used to prevent the heads from splitting in driving, or from becoming too much compressed. In some cases, piles are driven with the broadest end downwards, as for example, in foundations executed upon extraordinary depths of compressible mud; and Perronet appears to consider that there is some advantage in adopting this system when the middle of the height of the piles is situated at nearly the mean level of the water, a condition which sometimes occurs in the erection of large timber bridges. From some experiments made at L'Orient, recorded in Sganzin's Cours de Construction, it appears that piles so driven offer a resistance equal to about 45½ lbs. per foot superficial of their frictional surface, which is barely a fifth of the resistance they would offer, if driven to a solid stratum. It is important to drive the piles, if this mode of placing them with the broad end downwards be adopted, by beginning with the outer rows, and working inwards towards the centre of the mass.

When piles are used in solid ground, and are designed to resist a vertical pressure, they are driven by means of engines until what is called a "*refusal*" is attained; that is to say, until they only descend a certain depth under an impulse, which is made to vary with the nature of the superstructure, the number of the piles employed, or the machinery used for driving: but when the piles are intended to resist a transverse strain, or any tendency of the foundations to lateral displacement, they must be driven until they attain a solid substratum, without reference to the resistance they may meet with in their descent. It is considered by some engineers, that the ground around the piles becomes so compressed in the former case that an adequate resistance in the foundations is secured, even when the piles are not driven to the more solid strata. In the latter case, the piles become fixed in the materials through which they are driven, and can only move by being displaced horizontally, or by being broken off on the line of thrust.

Although the earth in which piles are driven contributes to their power of resistance to an insistant load, it is not customary to take it into account; and the number, as well as the distance apart, of the piles is calculated as though they had to support the load without any assistance. In other words, the weight which is brought upon each pile is calculated upon the supposition that it should be able to support such a weight in the air, without crushing.. Under these circumstances, it is evidently necessary to diminish the weight upon any definite portion of the support in proportion as the height of the support itself is increased. Rondelet gives some tables of the weights which may be brought with safety upon the various descriptions of wood used for piles, according to their length; but it may suffice at present to observe, that when the length of the pile, supposed to be of oak, does not exceed sixteen times its diameter, it may be loaded permanently with a weight of from 430 to 500 lbs. per inch superficial of the sectional area, and the extreme refusal must be such as to ensure stability under such a load. There are few cases when the load above-named may not be slightly exceeded; at any rate, it must be considered to be fairly within the limits of stability, although far in excess of the load usually applied.

The rules generally adopted for fixing the "refusal," appear to be empirical, and to require more elaborate investigation than they have hitherto received. It is customary on the continent to fix it upon the following principles. If each pile be intended to bear a weight of twenty-five tons, it is not considered to have attained its proper refusal until it will not descend more than two-fifths of an inch with a series of thirty blows from a ringing engine, with a monkey of 12 cwt. falling four feet; or with a series of ten blows from a common pile engine, with a monkey of the same weight falling twelve feet. If the weight to be brought upon each pile should be 12½ tons, the refusal is altered to four-fifths of an inch; and if it be only 5 tons, it is altered to two inches. But it must be evident, that the vibrations excited in the piles themselves, or in the ground, must differ so essentially under the conditions of the ringing engine with the small fall, from those which hold with the piling engine with the great fall; and the effects of the action and reaction developed under these respective circumstances must be so dissimilar, that no simple geometrical ratio can exist between the efforts exerted in the respective cases. At the bridge of Neuilly, where each pile supports a total weight of fifty-two tons, Perronet adopted the refusal of one-fifth of an inch for each series of twenty-five blows, with a fall of about four feet eight inches.

The engines generally employed for the purpose of pile driving are the ringing engine, the pile driver, and Nasmyth's hammer. The first consists of a frame in which a monkey, or rammer, is raised vertically above the pile by means of a cord passing over a large wheel, and worked by a number of men standing around. As all intermediate machinery is avoided, the blows struck by this engine follow one another with tolerable rapidity, and may easily be carried to twenty or thirty per minute; but the weight raised is necessarily limited by the unfavourable mode in which the power is applied, and the fall is equally confined within a small range. In the ordinary pile engine, the monkey is raised to any desired height by means of a crab; so that the weight of the monkey, and the height of the fall, may be made to vary within very considerable limits; but the number of blows given within a definite period becomes diminished in the same proportion that the power of the engine increases. Of late years, the Americans, and many of our contractors after their example, have applied steam power for working machinery of this description with considerable success. Nasmyth's hammer is, however, the most decidedly marked modification of pile driving machines lately introduced, and when applied under the proper conditions, it appears likely to render great service. Dr. Potts' system, and the modifications it has lately received, appear to be more adapted to secure the descent of what may perhaps be correctly described as small caissons, than of piles, as the word is usually understood. Attention is therefore called more exclusively to Nasmyth's hammer, as presenting the greatest advantages in certain situations.

It consists of a cylinder, in which a piston bearing a rod connected directly with the monkey, or striking mass, is made to move in one vertical direction by means of high pressure steam, which escapes directly the piston reaches the head of the stroke, and allows the monkey to fall by the mere effect of gravity. The weight of the monkey need only be limited by the capacity of the cylinder, or the elasticity of the steam; and accordingly in practice it varies from 32 to 45 cwt. The height of the fall is, however, limited by the stroke of the piston, and rarely exceeds 2 feet 6 inches. At the same time, it is to be observed, that the number of blows is greatly increased beyond that which can be given by any hand gear; and instead of being from thirty-five to forty per hour, as in the case of the ordinary pile engine, it becomes from fifty to sixty per minute. The effect of each separate blow under these circumstances is naturally less with the Nasmyth's hammer than with the old engine; but the rapidity with which the blows succeed one another must considerably modify the descent of the piles, particulary in ground able to transmit undulations separated by long intervals. The whole question of the influence of the elasticity of the ground upon the rate and manner of descent is, however, still involved in too great uncertainty to admit of any definite conclusions on the subject; and indeed, it is found to complicate not only the theoretical reasoning upon, but also the practical operations connected with pile driving, to a very serious extent.

For instance, it has been frequently observed that after a pile has received a certain number of blows from an ordinary pile engine, it will "refuse," or cease to drive. But if it be then allowed to rest, and after a definite period the driving be recommenced, the pile will descend rapidly under blows of far less power than those which were previously unable to move it. This phenomenon has been attributed by some authors to the increase of the reaction of the ground developed by an exaggerated "vis viva;" by others, to the fact that the pile itself, and the ground round it, assume a state of vibration, which, for the time, disperses the effort exercised on the head of the pile. Nearly all the investigations which have been made with respect to the transmission of movement in elastic media, have been made upon the perfectly elastic gases; and they hardly bear upon the conditions likely to prevail in the denser, less homogeneous, and comparatively speaking non-elastic, materials into which piles are usually driven. But it appears at least more probable that the vibratory undulations produced by heavy blows succeeding one another at distinctly perceptible intervals, should, on their reflux, coincide and interfere with the transmission of a succeeding blow, than that the lighter blows following one another almost instantaneously should give rise to undulations of a character to check the descent of the pile. Indeed, in the latter case it is possible that the undulations—especially if they be reflected—would so far interfere with one another as to procure a comparative stillness of the ground.

The "refusal" to be adopted when Nasmyth's hammer is employed, may easily be calculated from those before given for ringing or for pile engines—assuming that the forces bear to one another a simple geometrical ratio. If a hammer of 34 cwt. be used with a fall of 2 ft. 6 in. a succession of seventeen blows would produce an effect presumed to be equal to that of thirty blows from a ringing engine of 12 cwt. with a 4-feet fall; or ten blows from a pile engine of 12 cwt. and a fall of 12 feet.

In the majority of constructions there is little difficulty in attaining these conditions; nor does the use of the Nasmyth's hammer ordinarily produce effects upon the descent of the piles themselves different from those which are to be observed when ordinary machines are employed; and in such cases, if a sufficient number of piles are to be driven to cover the outlay necessary to set the machinery to work, the economical results it produces are superior to those obtained by the use of any other engines I have had the opportunity of examining. The great rapidity, however, with which the blows succeed one another causes a much more considerable waste of timber in the pile heads than in using the old engines. If the wood happens to be soft, it is found, indeed, that the head becomes spongy in a short time, and incapable of transmitting the impact. If, on the contrary, it is hard, the piles often take fire. Moreover, if the wood should be (to use a workman's phrase) shaky, and the ground hard, any vertical fissures become rapidly increased by driving—in all probability on account of some inequality in the transmission of the undulatory movement communicated by the blows through the different fibres, whose conditions of elasticity are often visibly dissimilar. The softer woods are most exposed to this disadvantage.

It appears to me that Nasmyth's hammer is less likely to develope this tendency to vertical fissure than the old pile engine; because the effective power of each particular blow is less than when the monkey is made to fall through a great height. In moderately resisting ground therefore, there appears, on this score also, to be an advantage in its use. But it is important to observe that it is precisely in such situations that the pile is likely to become deflected from its course; and if this effect be produced to such an extent as to cause the blow to strike the head in a direction inclined to the axis of the pile, the latter is exposed to be broken, or at least strained, to a serious extent, whatever be the system of driving employed. It is in very hard ground, and when the hard woods are used, that the piles are most likely to become ignited under Nasmyth's hammer.

These theoretical observations were confirmed by some circumstances noticed by myself during the execution of the works for the repairs of the Blackwall entrance of the West India Docks, in which I also had an opportunity of learning practically the conditions most unfavourable to the use of the steam pile hammer. In this instance the side wall of the river entrance to the Blackwall Basin was carried into the channel by a lateral movement of the ground, apparently produced by some copious land spring, or by the escape of the water retained in some of the inner basins at low tides. The old wall was carried bodily forward for a length of about 120 feet, in a kind of irregular curve, whose maximum versed sine was about ten feet: it sank about nine feet below its original level, and forced up the bed of the navigable channel nearly three feet. Mr. Rendel, who was consulted by the Directors of the Company, decided upon replacing the old wall by a timber staging. This was intended to be close planked at the back, on the land side, in order to retain the earthwork of the pier heads; to have a paved stone floor in the intermediate portion, between the close planking above mentioned, and a corresponding parallel row of close piles driven towards the water-way. It was proposed, also, that the whole of the piles to be driven on the inside of the old wall should be placed before the old works were removed—excepting, of course, in the positions where they interfered with the piles. The masonry and the earthwork, both in the channel and in the situation of the new stone floor, beneath the staging for the pier head, were to be removed after the completion of the latter.

The effect of retaining the ruins, in combination with the compression of the subsoil which had already been produced by the weight it had supported for so many years, was to create a degree of resistance to the entrance of the piles totally unprecedented. The ground itself consists in parts of a bed of rounded flints, agglutinated by fine white sand, occasionally containing veins of the hydrous oxide of iron. Apparently it is of the same nature as the Gun Fleet shoal in the bed of the Thames; and geologically it is analogous to the member of the basement beds of the London clay which occurs upon the surface near Bromley in Kent. When this bed is not confined laterally, it does not offer any very extraordinary difficulties to the descent of piles, or to the operations of boring—although evidently, in consequence of its composition, it must exercise great friction, both upon the boring tools and the piles driven through it; and the resistance so occasioned would naturally be seriously felt when it became necessary to insert close, or sheet piling. But, in this particular case, it appears that the old wall acted to prevent the gravel from spreading; and consequently the new materials, the piles, could only be introduced by displacing and compressing the materials into which they were forced. It followed that the labour, difficulty, and cost of the formation of the stage were increased to such an extent as to entail a very heavy pecuniary sacrifice; and, indeed, in the case of some trial borings, to induce the contractor entirely to renounce the attempt to traverse the bed of gravel.

Under normal circumstances the cost of driving piles, properly shod and hooped, by Nasmyth's hammer, would have been about 2s. per foot forward in ground of this description, and upon an average of guage and sheeting piles, the rate of progress would be about five feet per hour. The cost of driving by hand gear would have been about the same; because the magnitude of the work in question was not such as to render the cost of the temporary staging required for the hammer an unimportant element in the relative value of the work effected by it. But, in consequence of the induration of the ground, from the causes before mentioned, the rate of descent was so materially altered that in the space of 1¾ hours no less than 5,880 blows were struck upon a pile head in the presence of the author, without advancing it more than three inches. Naturally, under such circumstances, the pile heads were rapidly "knocked up;" and frequently, when fir timber was used, as many as six or seven heads were required, thus entailing a loss of from four to five feet lineal of the baulk. When rock elm was used this source of expense was diminished; for it was found that the heads would in this case last three times as long as those of fir piles. But the nature of the timber did not otherwise affect the rate of descent, which varied from one foot to three inches per hour, and frequently cost as much as forty-two shillings per foot lineal, merely for the labour and working of the engine—leaving entirely out of account the expense of re-heading the piles, or any charges for superintendence, rent, rates, or taxes.

Excessive as this cost of the work was in itself, it was, however, still further increased by many of the piles being broken during their descent, in consequence of the shoes working off, and also of the development of longitudinal fissures. In some cases, where these fissures ran at a slight angle across the pile, the latter became so shattered, and the fissures opened to such an extent, as to render it necessary to cut off, or even to draw the piles, after considerable progress had been made in driving them. Both these sources of expense were of irregular occurrence, and it was almost impossible to guard against them; for neither the inequality in the resistance of the ground could be foreseen, nor do the longitudinal fissures always show on the sides or the ends of timber baulks in their original state before driving. The piles drawn on account of the loss of shoes were two; those which were drawn or cut off, on account of defects in the timber, were about ten in number: and it may be added that towards the end of the work it became necessary to use rock elm constantly instead of Baltic fir, from the increased resistance to the descent.

That this increased resistance was to be attributed to the compression of the ground, was proved by the following facts: In order to carry the stage close up to the old wall as it then stood, it was necessary to remove the ruins of the portion immediately upon its intended position. The first piles which were then driven descended with such ease, that in some instances 26 feet descent was obtained per hour, and the slowest rate was 1 foot 3 inches per hour in the case of the piles immediately behind the old wall. The guage piles, even in that portion of the works where the wall had not been removed, descended at the rate of 5 feet per hour. But the filling-in piles of the close sheeting became more and more difficult to drive as the work advanced; until at length the closers could not be driven more than 2 or 3 inches per hour, the engine working incessantly at the rate of about 60 blows per minute.

At the Great Grimsby Docks these difficulties did not occur. The works were, in this case, executed upon the alluvial mud at the mouth of the Humber, which lies (with a variable thickness) upon a stratum of hard clay. In consequence of the inequality of thickness in the upper stratum the piles varied considerably in length; being occasionally 70 or 50 feet long, whilst the average length was 30 feet, of which the last four were in the harder clay. Sometimes the piles would traverse the first 26 feet in an hour, and the remaining 4 feet in half an hour; at others, and especially when many piles had already been driven near the position of the one observed, the resistance was greater. But there were few instances in which a less number than from 30 to 50 piles were driven per day by a single engine. To perform a similar amount of work with the ordinary pile engines would have required at least from 10 to 12 machines, with their respective gangs of workmen; so that it would appear that, under favourable conditions, the economical results of Nasmyth's hammer are such as to ensure its adoption. The cost of working the engine employed at the West India Docks, and at Great Grimsby, was about 10s. 6d. per hour, including wages of driver, stoker, carpenter to attend to the pile, labourers, and incidental expences; whilst the cost of each of the ordinary piling engines would not be less than £1. 0s. 6d. per day, without any allowance for interest on capital, depreciation, repairs, &c.

The practical conclusions which I am disposed to draw from my experience in the use of the various descriptions of engines for the purpose of driving ordinary piles, may be stated briefly as follows:—

1st. Ringing engines are adapted to driving short piles through ground of a moderate degree of hardness, but the immense number of men they require must exclude their use when the works are extensive, and many piles are to be driven.

2nd. Ordinary pile engines, or those in which monkeys of about from 12 to 16 cwt. with falls between 12 and 26 feet are used, are the most efficient and economical when the number of piles to be driven is small, or when the ground is remarkably hard.

3rd. When, however, the number of piles is great, and the ground of an ordinary degree of hardness, Nasmyth's hammer is the most economical mode of executing works of this description.

It must, then, it appears to me, be the duty of the contractor to carefully estimate the relative proportion the first outlay will bear to the whole expense of the works, and to ascertain the precise nature of the ground (both in its original and its contingent states) before he decides upon the machinery he will adopt for pile-driving in any particular case. The engineer or architect probably ought also to take these considerations into account, before he fixes the time for completing the works.

In certain positions the use of Mitchell's Screw Piles appears to have been attended with remarkable success, but their applicability, it may be suspected, is far from being universal. They are admirably adapted for positions in which the piles are required to resist an effort of tension; because in such cases they cannot forcibly be drawn by a direct pull, unless at the same time the prism of earth around them is displaced. Where it is desired also to drive piles to a considerable depth in a semi-elastic stratum for the purpose of resisting a lateral strain, rather than an insistant weight, Mitchell's Screw Piles have great advantages over others for these reasons: first, they can be made to descend with greater ease and certainty; and secondly, they can only be displaced, in this case also, by the removal of the surrounding prism of earth. If, however, the use of piles be resorted to principally for the purpose of producing compression of the subsoil, it may be expected that this effect will not be attained so satisfactorily as by the old mode of driving, because the gradual and easy descent of the pile confines the lateral compression of the ground to the immediate vicinity of the pile itself. I am not aware of any direct experiments upon the resistance of these piles in peat, or soft compressible mud of indefinite thickness, of a similar nature to those alluded to in the case before cited of L'Orient, in which piles with the but-ends downwards were used.

Dr. Potts' system of driving piles by atmospheric pressure, before alluded to, originally consisted in the use of hollow tubes of cast iron, open at bottom and able to be closed at top; the open lower end of which was placed upon the surface to be traversed. When the tube had descended as far as possible by its own weight, the ground in the interior was extracted, and the tube being placed in communication with an air pump a species of vacuum was formed. The atmospheric pressure upon the top then naturally caused the tube to descend, until the compression of the inner air enabled it to counterbalance the weight of the external atmosphere; the earth in the interior was then again removed, and the operation repeated until a sufficiently solid substratum was reached, when the interior of the tube was filled in with concrete. Latterly the tubes have been executed of such dimensions that they ought more properly to be called caissons; and in the foundations of Rochester Bridge, Mr. Hughes is said to have introduced so many alterations and improvements into the system that it would be highly interesting to compare the successive modifications of the original idea, the real merit of which perhaps, after all, should be attributed to Coulomb, who, in the year 1788, published a memoir entitled "Recherches sur les Moyens d'executer sous l'eau toutes sortes de travaux Hydrauliques sans employer aucun épuisement," which contains the germs of much that is assumed to have been invented at later periods. Be this as it may; the circumstances under which the use of open cylindrical caissons appear to be desirable may be stated to be when the compressible substratum is of small depth, and when it is immediately succeeded by a thick stratum of incompressible material. It is essential that the latter also should be of a nature to resist the dissolvent action of water, in case the smooth sides and cutting edge of the cylinder should lead that element to the substratum. Upon railways, to quote one instance of the situations in which these cylinders might be used, it may be necessary to cross a long, semi-fluid bog—as upon the Munich and Augsburg line. The system actually adopted there was to sink holes through the peat, in alternate squares like a chess-board, about 2 feet wide at the bottom and 3 feet at the top, the average depth being about 15 feet: these holes were filled in with puddling clay, and the embankment was carried upon them. In this particular instance the peat was sufficiently solid to allow of the holes being cut and left without any support; and to resist the lateral displacement of the clay. Had it, however, been similar to many of the Irish bogs, the use of some such caissons as Dr. Potts introduced would have been indispensable, and, perhaps, it would have been preferable to have sunk them by pneumatic pressure, rather than in any other way. Our Trans-Atlantic brethren content themselves with carrying their railways over such foundations upon common piles, partially driven into the ground, and partly standing above it—a mode of proceeding which may answer in countries where it is essential to keep down the first cost of such enterprises, and where wood is sufficiently cheap to render it unnecessary to regard its waste. But evidently piles thus partially exposed and partially covered up are liable to rot with great rapidity.

In these remarks I have not attempted to draw any comparison between the various methods of forming artificial foundations; simply for the reason that the investigation of the circumstances which would render it advisable to resort to the exclusive use of either concrete, timber platforms, or of piles, is of so wide and complicated a character that it would require far more time than we can at present devote to it. If, however, it should appear to the Members of the Institute that the subject offers sufficient interest to induce them to devote another evening to the consideration of this branch of construction, I shall be extremely happy to bring it again under their notice. Indeed, I have designedly dwelt in a superficial manner upon the application of Dr. Potts' system, and the general use of caissons, because they would in fact be better discussed concurrently with the general question of Artificial Foundations, than in connection with the more limited one of Pile Driving. The difficulties and the phenomena attending the latter class of operations were the reasons which induced me to call your attention to them previously to bringing before you the consideration of the circumstances under which they occur.

ERRATUM.

In Paper of June 11th, page 111, line 16 from top, omit the word *suppositious*, and read—*case that occurred in his own practice.*

APPENDIX.

29, Clipstone Street,
15*th January*, 1855.

Dear Sirs,

During a recent perambulation in the County of Surrey, I was pleased to find that Kentish Rag-stone may be procured from a locality about twelve miles more westerly than any that had heretofore come under my notice; and as a new source of supply, of a well known building material, may be advantageous to your profession, I am induced to offer these few remarks to the notice of the Institute.

At about one mile and a half south of Godstone, the bottom beds of the lower green sand formation rise suddenly at an angle of nearly 45°, presenting decisive evidence, either of a sinking towards the chalk, or of elevation in an opposite direction, to form the escarpment of Tilburstow Hill. This stone contains a superabundance of quartzose grains of sand, often angular or slightly rounded, interspersed with very minute plates of mica, and scarcely any carbonate of lime. The strata vary in texture and composition, from the state of soft sand-rock to that of irregularly shaped nodular masses of great hardness, in most cases tinged with oxide of iron, of various shades, from whitish gray to a deep ferruginous brown. The transition is sometimes very sudden, from loose sand into compact stone of a dark gray colour, in which the original sandy structure is scarcely discernable; in other specimens the gradations are almost insensible. Between some of the beds, clay, having a smooth and saponaceous feel, is rather abundant; it is, in fact, a kind of "*Fuller's earth.*"

In their geological position, the rocks of Tilburstow Hill correspond with those from which the "*Kentish Rag-stone*" is procured in the neighbourhood of Maidstone, or through the central part of Kent, and in some of the minor features they are similar. The softest sand-rock of Tilburstow quarry may fairly be considered identical with the "Hassock" of the Kentish Rag district; and if the harder varieties were removed to London, or to a distance from the quarry, I doubt whether the most experienced mason, or learned mineralogist, could detect the difference between this mineral and its counterpart from the Rag-stone district of central Kent.

Therefore, as the Kentish stone and that from Tilburstow Hill correspond in all essential qualities, and as the former is so thoroughly well known for architectural works, it will be useless to dwell further upon the subject; suffice to say, that the two materials may be used under the same circumstances, for similar purposes, in the same or other building, without prejudice to the edifice in any way whatever.

A new Aisle, on the south side of Godstone Church, has been built with this stone during the last two or three years.

I remain,

Your respectful and obedient Servant,

C. H. SMITH.

To the Honorary Secretaries of the
Royal Institute of British Architects.

12, *Avenue Road,*
January 27th, 1855.

My dear Sir,

I have hoped to gather some information from an assistant, who was engaged for some time at the church at Chesterfield. He has read the paper and discussion, but I do not know that he has very much to add to what has been said. He took the exact amount of deviation in 1842, which he found to be 6 ft. 6 in. southward and 2 ft. 6 in. westward. This seems to exceed that found to exist by earlier observers, and strengthens the supposition that the evil is on the increase.

There can be, I think, little doubt that the primary cause was the heat of the sun on the south and west sides, which warped the timbers, drawing them in the direction of the heated side. It may have been increased at a subsequent period by decay, but this could not have been the original cause of the framework throughout its entire height having sustained this extraordinary twist, for the deviation from the true form is anything but a simple inclination. It is a twist, very similar in kind though differing of course in degree, to the horns of some animals, and appears to change with every point of view. I have no doubt that the spire was built of green timber, which being also needlessly large, was affected to a very extraordinary degree by the sun. I may mention that nearly every timber spire has some tendency to bend to the south-west.

There is a remarkable instance of the lightness of which a timber spire is capable, when carefully framed, in that of the Church (I think Wren's) in Rood Lane.

I remain, my dear Sir,
Your's very faithfully,
GEO. GILBERT SCOTT.

C. C. Nelson, Esq.

PAPERS

READ AT

The Royal Institute of British Architects.

SESSION 1855—56.

USUI CIVIUM, DECORI URBIUM.

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SOME REMARKS ON THE PRESENT CONDITION AND FUTURE PROSPECTS OF ARCHITECTURE IN ENGLAND.

Made by W. Tite, Vice-President, M.P.

At the Opening Meeting of the Session, 1855-56, of the Royal Institute of British Architects,
November 5, 1855.

Mr. Tite commenced by observing that it had been generally the practice, at the Opening Meeting of the Session, for the Chairman to make a few observations on the principal events which had occurred during the recess: he himself had occasionally followed that course, but on the present occasion his thoughts had been turned in another direction, and he had, therefore, announced his intention of occupying their time with some remarks on the present condition and future prospects of architecture. He had been much led to this subject by an incident which occurred at a recent meeting of another society, the Architectural Association. At their first meeting, about three weeks since, he was a visitor. The association was a body of young men who met to prosecute their studies, and with one of whose suggestions he had been much pleased. It appeared that the members felt the necessity of something like a diploma, or some other recognition of their attainments, and that they were willing to submit themselves to an examination, in order to obtain an opinion on their professional merits and attainments. He (Mr. Tite) thought this was a step in the right direction. The association, when he attended its meeting, was addressed by the chairman, a man of considerable talent, Mr. Bailey, in a very able and suggestive address, embracing much that was wanted by young men about to embark in an anxious and arduous profession; and the suggestion he had referred to was one which had strongly commended itself to him,—and he could not but regard it as a remarkable fact that these young men should feel it so desirable that their attainments should be recognized, that they should offer themselves voluntarily for examination. It was an important step in the history of their art. As Mr. Bailey had said, if they were exposed to competition, that competition could only be met by showing that architects possessed superior attainments beyond the reach of those with whom they had to compete for public favour.

In considering the present position of architecture, Mr. Tite could not but advert to what it was when he first embarked in life. At that time the number of architects who had any claims to the title amounted in London to about fifty; and there were not more than four or five leading men: to one of those he was articled. It was then the custom to devote six years of a young man's life in that way,—and that was a concession of one year from the ordinary period of seven years' apprenticeship. At that time there was a fallacy, which perhaps even existed to some extent at this day, that it was necessary to send a young man who desired to be an architect into the carpenter's shop,—or as it was technically called, he went for "three years to the bench." He could hardly conceive how three years could be more completely wasted. The idea of sending a lad from school into a workshop to be qualified at the end of the term only in a very imperfect way to put together a door or sash, did appear to him to be a most extraordinary waste of time. Luckily for himself and his friends, he escaped the ordeal. He served his articles, he hoped, faithfully and honestly, for six long years. In the present day he believed the practice had erred in an opposite direction, and it was now the custom to article a youth for three years only,—in which time very little could be learnt. Formerly, the opportunities which an architect had for study and improvement were few and costly. There was abundance of information of great value, but it was scarcely attainable; and the first move that was made to obtain information was by means of an Architectural Association, where a few earnest young men met together to make a design or a sketch from a given subject, or to discuss a short paper read by one of the members. That association memorialized the Royal Academy for literary assistance, and the Royal Academy opened their library to them once a week; and there they had access to books which were otherwise not within their reach. On looking through his own library he found that there was no want of books at the time referred to, which would teach a man the elements of his profession; but they were costly, and in some instances somewhat scarce. In 1762, Stuart published the first volume of his "Athens:" the second volume was published in 1787, and the third in 1794: the first volume of the "Ionian Antiquities" appeared in 1769, and the second in 1797; "Palladio," by Leoni, in 1715; and Adams' "Spalatro," in 1754: Chambers' Elements of Architecture were published in 1759, and he was building Somerset House in 1774. The well-known work of Desgodetz, "Les Edifices Antiques de Rome," was published in 1682: but all these books were very costly, and at that time there was no institute or society through which the information which those books contained could be reached by ordinary students. With regard to Gothic architecture, there was the work, "Vetusta Monumenta:" Carter commenced his "Ancient Architecture" in 1795. Britton produced the first volume of his "Antiquities" in 1806; and the fourth volume in 1816; and he commenced his "Cathedrals" also in 1816. But there were no books generally accessible, and the young architect had enormous difficulties to encounter. At present every kind of information was easily obtained at a very trifling cost. Among the earlier steps leading to this result was the foundation of the Architectural Society in 1831, under the patronage of the Duke of Sussex. The Institute of British Architects was later in point of time, and it was unfortunate that the profession was separated by the existence of two institutions. He himself joined the Architectural Society, and after some years became its President, and when the proper time arrived, he did his best to promote the union of the two societies, which was eventually accomplished. The Institute was founded in 1834, and obtained its charter in 1837. In 1835 they received Sir John Soane's donation of £750.; in 1842 the two societies were united; and in 1848 the Queen first bestowed the Royal Gold Medal. At the time of the foundation of the Institute, it consisted of twenty-five fellows and subsequently fifteen associates; and although he had to regret that the members were not more numerous than they were at present, he still thought that on comparing their present with their original numbers, and considering the many eminent men who had joined them, they were justified in congratulating themselves on their present position.

The next question that occurred to him in looking at the present position of architecture, was to inquire what was the influence of the Institute at the present day. Upon the profession itself, he believed that it was considerable and important. At the Institute the student had access to a valuable library, to lectures and discussions, and he believed that there were advantages in connection with it for the promotion of their architectural position, which without it they would altogether have failed to obtain. With regard to its influence upon society, though it would be wrong to assume that the Institute had its proper position among the literary bodies of London, it had obtained a certain amount of influence, which had been apparent in two recent instances. One was in reference to keeping the land on the south-east side of St. Paul's open for the public. The Institute moved in the matter, and appointed a Committee, and the public attention which they were able to call to the subject had, he ventured to hope, secured that great object, almost national in its importance. This was mainly to be attributed to the influence of the Institute as a united body. The next instance was the Building Act. The old Act, which, as they knew, was very imperfect, had existed for ninety years; but no two men could agree in amending it. About ten years ago, however, the Government brought in another Act, which was very complex in its machinery, and under which it was very difficult to obtain a decision on any contested point. The late lamented statesman, Sir William Molesworth, had the courage to undertake the matter. He only regretted that Sir William Molesworth had not been spared to receive the congratulations of the Institute for having successfully combatted the difficulties which surrounded the question. In that matter the Institute had made its influence felt. He had the pleasure of being the chairman of the committee on that subject appointed by the Institute, and although he began by opposing the Bill, he became so satisfied of the perfect sincerity of Sir W. Molesworth, and of his desire to make the Bill useful and workable, and to adopt any reasonable suggestions, that in the end he became a warm supporter of the measure, and by a train of fortunate circumstances had the honour of becoming a member of the Parliamentary Committee itself, and of assisting in passing the Bill. He did not mean to say that everything was done that might have been done, but by sweeping away the complicated machinery of the previous Act, a great deal of good would doubtless be effected. The only unfortunate parts of the Bill were the clauses introduced at the instance of the builders in opposition to the architects, and those clauses he believed would lead to difficulties hereafter; but he did claim for the Institute, as a body, that its influence in the question had been felt, and the Institute was now in the position of being the examining body for the District Surveyors. It was a great step in advance that their position should be so acknowledged. There had been some difficulty in passing this provision of the Act. It was strongly opposed (he knew not why) by the present Duke of Somerset (then Lord Seymour), and supported by Lord John Manners; for which courtesy he was bound to thank his lordship, as well as to congratulate the Institute that it was now the law of the land.

He would now pass to the effect of the Institute upon architecture generally, and in that respect he thought they had nothing to be ashamed of. In visiting the French Exhibition, he had endeavoured to ascertain whether they were behind-hand with their neighbours; and with every desire to exempt his mind from national prejudice, he thought there was nothing to be seen in Paris, in the more recent productions of the French artists, to make English architects ashamed of the comparison. In London, he thought that the architects had done well, and, to use a common phrase, had held their own. As very recent instances, he would quote the British Museum, and the new Palace at Westminster. In the latter all that the most refined taste and anxious industry could effect had been accomplished. Those who chose the style had to answer for that choice; but the work had been carried out with taste and judgment, and Sir Charles Barry had entered most thoroughly into the feeling and spirit of the Gothic architecture of our ancestors. As to German architecture, the great works of Klenze, of Munich—the Walhalla, the Glyptothek, and the Pinakothek,—were splendid specimens of modern art, but his attempts at Gothic were absurd. The Museum at Berlin was a great work of Schinkel; but his "Entwurf" for the church of St. Gertraud, was so wretched that it was well for the city of Berlin that it remained only a project. In St. George's Hall, Liverpool, architectural decoration had been carried to a great extent, and that building was certainly quite upon a par with the works of any of the French architects.

With regard to modern Gothic architecture, it was difficult to compare that of France or Germany with that of England; perhaps because English Gothic, as seen in our best examples, as Westminster, York, Salisbury, or Beverley, was peculiar in taste and detail, and differed from the Pointed architecture of France or Germany. But, upon the whole, he considered modern French Gothic very inferior indeed to that of England, in its general effect as well as detail. He thought the church of St. Clotilde, on the whole, a failure; and he had seen a church in course of construction, in Paris, near the Faubourg Poissonnière, in which there were cast-iron columns and cast-iron ribs, filled in with plaster, in such a manner as would not now be tolerated for a moment in England.

He was of opinion, however, that Gothic architecture was too fashionable in England; and he sincerely regretted it;—partly, perhaps, because of early teaching, and perhaps because his recent visit to Italy had revived his old impressions. Classical architecture appeared to be almost forgotten by English students; and he had been exceedingly struck by the fact, that in a clever and well-written book, by an architect, on "The Gothic Architecture of the North of Italy," classical architecture was ignored and despised. This was a sign of the times which, as an architect, he was bound sincerely to regret. At one time English architects had been mad for Grecian architecture; but now both that and the great works of Wren, Palladio, Inigo Jones, and the great architects of Italy were neglected; and one gentleman (Mr. Ruskin) admired to the very echo the Ducal Palace at Venice—a feeling which he regretted should exist among the architects of England. The writer of the book to which he referred had engraved, as a beautiful example, a window in the very angle of the main story of one of the principal palaces; to effect this the angle was cut through, and the upper part, of very heavy architecture, was supported on corbels only a few inches thick. He had himself been taught that the weight should be carried consistently and honestly; and so violent a departure from that rule as this and many other instances he could quote in Venice, he could not consider consistent with architectural truth. He thought that architects and architecture were much indebted to Mr. Ruskin, but he regretted that his lot had been cast in Venice; for of all the ugly types of Gothic architecture to be found on the continent, that of Venice was, in his opinion, the most ugly; and although he agreed with Mr. Ruskin and Mr. Street that the origin and progress of Gothic architecture might be traced in Venice more successfully than elsewhere, his own opinion was, that the Venetians never attained any eminence whatever in that style of architecture, and that all that could be claimed for it was a certain amount of picturesque prettiness. He did not know whether these views were acceptable to the meeting, but he wished to recall the serious attention of the profession to the beautiful architecture of Italy, and its exceeding fitness for English religious observances; its facility for accommodating large numbers, and enabling them to join conveniently in the service, and to hear the sermon. At the same time he did not undervalue our attainments in regard to Mediæval architecture, of which, especially in regard to decoration, we had every reason to be proud; and which contrasted favourably with those of French architects.

He wished he could speak in similar terms of the public improvements in London, on which, it is true, enormous sums had been expended; but the French had done the same thing in a way which put English parsimony to shame. The tower of St. Jacques, as restored, and forming the centre of a large open space, constituted one of the finest objects in the magnificent new street in Paris, and redeemed it from tameness and monotony. This fact, together with the noble space round the Hôtel de Ville, showed there was an amount of taste and liberality in Paris which it would be well to imitate in London. The difficulty the Committee of the Institute had had to contend with to secure the vacant ground at St. Paul's was a matter for which the people ought to take shame to themselves, when contrasted with the sacrifices which the French had made for the improvement of their metropolis.

In regard to the present position of architects, it was to be observed that they were now rather in a transition state. Formerly, architects and engineers were not separated as at present. Mylne and Alexander, both architects, constructed Blackfriars Bridge and the London Docks; and if the engineers had gone a-head of the architects in later times, it was the fault of the architects themselves. They were quite able to help themselves. Every gentleman present might be an engineer, an architect, a builder, a decorator, or anything he pleased. The difficulty he had referred to was to be met simply by superior attainments on the part of architects; bearing in mind that in England men would always be estimated in proportion to their practical ability.

With regard to the future prospects of architecture, the great object to be desired was a test, by examination, of the ability of its professors; and he hoped the time would come when the Government would employ architects and engineers because they were recognized by their professional brethren, and an architect would be honoured because he had passed an examination before the Institute of British Architects; and the more so if they went to that examination voluntarily.

Mr. Tite proceeded to read the substance of the qualifications required from architects in Prussia, who were subjected to a strict examination in literature and general and technical science, the examination being oral, public and competitive.

He believed that those who, like himself, had practised as an architect for thirty years, must feel that, after a time, most of the things included in the Prussian regulations would be demanded of English architects; and he hoped that some system of examination would be carried out, for upon that alone would depend the advancement of the art. There was no other mode of getting "the right man in the right place," than to let the right man be properly informed of what he had to do. The Council of the Institute had authorised him to state, that some of the topics which he had introduced to the meeting should form the subject of discussion on some future evening. In the meantime he must congratulate the profession on the progress it had made (and particularly on the offer of the younger members to submit themselves to a voluntary examination); and would urge them to consider carefully the comparative merits of Mediæval and Italian Architecture.

On the motion of Mr. Fowler, Fellow, the thanks of the meeting were voted to the Chairman for his address.

General Abstracts of Regulations for Architectural Education and Examination at Berlin—translated from the Original Papers—referred to in the Address of Mr. Tite.

Regulations for the Royal Architectural School at Berlin, 1849.

1. Title, &c.
2. The School is under the Minister of Trade. A Committee manages the details, consisting of a Managing Director, named by the Minister, and two members of the Upper Board of Works one for Architecture proper, the other for Civil Engineering.
3. The regular Lecturers are appointed by the Minister on a recommendation from the Committee.
4. Extra Professors, &c. may be appointed by the Committee for special purposes.
5. Applications for admission must be made in writing four weeks before the commencement of each Half Year (8th October and 8th April).

   In October of each year a new Series of Lectures, &c. will be commenced.
6. On application for admission the following certificates must be brought:—
   - I. By those who wish to enter Government service—
     - *a.* That they are first class men in some approved Gymnasium, &c.
     - *b.* That they have had at least one year's practice under one or more Architects.

II. By those who only wish to become Private Builders—

That they have passed the prescribed examination for Masons or Stone Cutters, and Carpenters.

7. Foreigners will be admitted (on same terms) so far as there is room.
8. A Fee of Ten Dollars is to be paid upon matriculation. The course of study will at first be fixed for five years, but the term may be extended by the Director.
9. Relates to details about attendance of the Students at the Lectures (*i. e.* They must at the commencement of the Half Year signify what Lectures they purpose attending, and upon payment of the Fees they will receive Tickets of admission).
10. If there is room the Director may grant admissions (on payment of the fees) to specific Lectures to any person, not a Student.
11. Upon request the Students may have certificates as to the Lectures they have attended.
12. The Half-yearly Sessions commence on the 8th October and 8th April, and close on the 20th March and 31st October. A week's holiday at Christmas, Easter and Whitsuntide.
13. The Lectures are so arranged that the Surveyor's course may be completed in two years, that of Architects proper in one, and that of Civil Engineers in one.

COURSE OF LECTURES AT THE ROYAL ARCHITECTURAL SCHOOL IN BERLIN.

Winter Session, 1851-2.

N.B. The Fees are all calculated at the rate of a three-quarter dollar (2s. 3d.) per hour of Weekly Instruction.

		Hours per Week.	Fee in Dollars.
1	Stereometry, Spherical Trigonometry, Analytical Geometry -	4	3
2	Simple Analysis, Differential Calculus, Law of Curves - -	4	3
3.	Descriptive Geometry - - -	6	4½
4.	Physics, with relation to Heat, Light, Electricity, and Magnetism -	4	3
5.	Chemistry, with relation to simple materials connected with Building -	4	3
6.	Construction of Buildings, Drawing - -	6	4½
7.	Antient Architecture, Application to present Time, Outline Drawing, first part	8	6
8.	Line and Architectural Drawing, first part (Ornamental Drawing) -	4	3
9.	Dynamics, first part - - -	10	7½
10.	Planning and Drawing Buildings, first part - -	4	3
11.	Farm Buildings, with internal arrangements - -	6	4½
12.	Antient Architecture, third part (Drawing) - -	6	4½
13.	Line and Architectural Drawing, third part - -	4	3
14.	Elements of Road and Bridge Making, and Hydraulics, first part -	3	2¼
15.	Machinery - - -	6	4½
16.	History of Antient Architecture - -	6	4½
17.	History of Architecture when the arts flourished in Italy -	6	4½
18.	Drawing from Models, &c. - -	6	4½
19.	Plans of Public Buildings - -	4	3
20.	Ornamental Drawing, first part - -	4	3

		Hours per Week.	Fee in Dollars.
21.	Doctrine of Probabilities (applied to the Theory of the correctness of Observations)	4	3
22.	Hydraulics and "Waterworks" in general - -	12	9
23.	Railways - - -	3	$2\frac{1}{4}$
24.	Machinery - - -	8	6

The EXTRA LECTURES comprise—

Further practice in the Differential Calculus, Conic Sections, Integral Calculus, Warming and Ventilating Buildings, History of Greek Architecture, Colored Decorations, Greek forms of Art (Buildings, Vessels, Implements), English, French and Italian Languages, Short Hand.

REGULATIONS FOR CANDIDATES, 1849.

1. The degrees of proficiency are—
   I. Surveyors.
   II. Architects.
      a. Architects proper. *b.* Civil Engineers.
   III. Builders.
2. Relates to the certificates to be handed in by Candidates for the Surveyor's examination.
3. If these certificates are found satisfactory the Candidate will be examined.
   a. On the scientific and technical subjects which are the basis of the further studies of Building Students.
   b. On knowledge of Land Surveying (no long practice required).
4. Relates to the certificates to be produced by Architects and Builders.
5. If these are satisfactory some suitable design will be entrusted to the Candidates, proper time and means of assistance being afforded.
6. After this is completed the examination will take place.
7. The Royal Upper Board of Works ("Bau Deputation") constitute the Board of Examination, but the Minister of Trade may appoint additional Examiners if he think fit. Their report is to be confined to the results of the particular examination, specifying each department of the subject.

   The viva voce examinations are public, and the drawings, &c. of the Candidates are at the same time to be exhibited. Unsuccessful Candidates are allowed a term, after which they may try again; failing again no further trials will be allowed.
8. The Surveyors when sworn are competent to manage the execution of Plans, under the supervision and technical responsibility of an Architect. Their statements as to size and quantities are to be relied upon (*i.e.* as evidence).
9. Surveyors who only wish to become "Road Inspectors" need not pass the Architect's examination, if they can prove a five years' satisfactory practice in Road making.
10. Architects may undertake the completion of designs, &c. on their own responsibility, and are competent to fill any suitable Government office.

    Builders may execute designs on their own responsibility, but only for simple "Country Architecture" ("nur für die Gegenstände des Landbaues.")

    They are not eligible for Government appointments, and may only fill a "Communal" office when that does not require attention to Roads and "Water Works" (Wege-und Wasser-Bau).
11. Surveyors, Architects and Builders may only execute such Land Surveys as are immediately involved in the practice of their profession.
12. Architects may only carry on any Building Trade (Carpenter, Mason, &c.) on their own responsibility, when they have passed the examination for the trade in question.

MODE OF PROCEDURE AT THE EXAMINATION OF THE CANDIDATES.

1. Examinations for Surveyors take place half yearly after the close of the Lectures at the Royal Architectural School in Berlin.
2. Candidates must prove—
    - *a.* That they come from the first Class of a Gymnasium, or of one of the "Real-schulen," approved by the Government.
    - *b.* That after leaving school they have had one year's practice, in Counting-house duties and in out of door Building work; and that, after this—
    - *c.* They have passed through a course of two years' study at the Berlin Architectural School, or one of the affiliated Establishments; in which case the course of study must be stated in detail.
3. Candidates must also hand in—
    - *d.* A plan of a Plot of Ground with Buildings, at least 5 acres extent, to a scale of 4 rods to an inch; also a Table of Levels with drawings (100 rods in length will suffice).
    - *e.* Sketch of a Building or a Machine, slightly colored with indian ink.
    - *f.* Other dawings, among which the Perspective of a Building, or an Ornament, must be clearly shown.
4. In cases where the preceding are not satisfactory, or cannot be rectified in proper time, the Candidates must wait till the next Half Year.
5. Relates to time for the Examination.
6. The Examination commences with one week's work in private; and in the succeeding week follows the viva voce Examination, lasting two days. According to the result in unsuccessful cases, a period of six or twelve months will be fixed, after which application may be renewed.
7. See also c § 8. Relates to the swearing in of Surveyors, merely provided that they are to be sworn before the Royal Building Commission, if they have not been previously examined and sworn as Land Surveyors.
8. Candidates for the Examination for Architects must prove—
    - *a.* That they have passed the Surveyor's Examination.
    - *b.* That they have been actively engaged under one or more Architects for two years.
    - *c.* That they have passed through at least one year's course of study after their having been examined for Surveyors. So that no person can become an Architect within three years of his having become a Surveyor.
    - *d.* That they have had proper practice and experience in Land Surveying. (The superficial area must not be less than 500 acres, or if difficult, at least 200, and about 1000 rods of levelling).
9. Candidates for the Builders' Examination must prove—
    - *a.* That they have passed the Masons', Carpenters', or Stone-cutters' Examination; and—
    - *b.* With respect to course of Study, the same as in § 2 c.

10, 11 and 12. Relate to the time to be fixed for the Examinations.

13. Candidates for Examination in both Branches (Country and Decorative Architecture, and Civil Engineering) must in addition to the preceding (§ 8) prove—
    - *a.* That they have practically learnt the Trade of a Mason, Carpenter, or Stone-cutter.
    - *b.* And have gone through a three years course of Study after having been examined for the above Trades.
14. Unsuccessful candidates will be told when they may apply again for examination. If they are unsuccessful a second time no further application will be received.

By a Supplement to the above it is enacted that the Integral and Differential Calculus shall, after 30th September, 1851, form part of the Examination of Surveyors—the same being now taught in the Architectural School.

EXAMINATION SUBJECTS.

I. SURVEYORS—(BAU-FUHRER).

Mathematics proper—
- *a.* Algebra, Analysis (simple), Logarithms.
- *b.* Geometry, Stereometry.
- *c.* Descriptive Geometry, Projection, Perspective, Shadow.
- *d.* Trigonometry, Superficial and Spherical Elements of Law of Curves, Conic Sections, Cycloids, Proficiency in Algebraic and Arithmetical Calculations, and in Use of Logarithms, and in Use of the Methods of Descriptive Geometry.

Practical Mathematics—
- *a.* Land Surveying, Levelling.
- *b.* Elements of Statics and Mechanics, Acquaintance with the Standards of Measure, Hardness, Friction, Strength, &c.

Natural Sciences—
- *a.* Physics and Chemistry (relating to materials used in building).
- *b.* Mineralogy and Geology, Signs and peculiarities of Minerals used in Building.

Country Architecture, (Landbaukunst)—
- *a.* Knowledge of Materials, their Peculiarities, means of Obtaining and Preparing them, when taken from the Vegetable World, their Botanical relations.
- *b.* Acquaintance with the simple construction of all Buildings (Baugewerke).
- *c.* Construction and Arrangement of simple Dwellings, Farm and Factory Buildings, Lime and Brick Kilns, &c.
- *d.* Antient Architecture, Forms of, and application to Buildings of our time.
- *e.* Making Plans and Corrections, (Revisions-nachweisungen).

Road and Railway Making; Waterworks (*i. e.* Buildings or Works in, or at, the Water)—
- *a.* Foundations in Water, Bridges, Embankments, Tide-walls, Mill-races.
- *b.* General Earthworks necessary in making a Railway, with Plans, Sections, &c.

Construction of Engines and Machines, composition and working of those most frequently used in Building,—Mills, Steam Engines in general.

II. ARCHITECTS.

A. For Country and Decorative Architecture.

The principal styles of Architecture of all Countries and Ages, Peculiarities and Advantages.

Laws of Construction, applied to large and difficult designs, Apparatus for Heating, Ventilation, Cooking Washing, Drying, Filtration, &c.

Dynamics.

Decorative Architecture, in all its branches, for Public and Private Buildings.

Business Arrangements, generally during progress of works.

B. Waterworks, Roads, Railways—

Analysis (compound), Law of Curves, Probabilities, Land Surveying;

Analytical Dynamics (applied to Nos. 3, 4, 5.)

Waterworks, (Wasserbau)—

- *a.* Waterworks in general; Atmospheric Products; Springs; Irrigation; Drainage; Foundations, &c.
- *b.* Making Canals, &c.; Flow of Water in Beds of Rivers; Hydrotechnic measurements; Means for Regulating the Current; for Making Rivers Navigable; Cleansing and Deepening the Channel; Wears; Floodgates; Rafts.
- *c.* Making Dikes; Drainage of Embanked Low Lands; Draining Machines; Sluices; Breaches in the Dikes.
- *d.* Land Communications; Ferries; Bridges of Wood—Stone—Iron.
- *e.* Erections by the Sea; Succession of Waves; Ebb and Flow; Currents; Strengthening or Securing the Shores, Harbours, Moles, Docks, Sluices; Securing Roadsteads and Lighthouses.

Construction of Engines—

Knowledge of different Forces; Arrangements for their Use; Winches; Levers; Water Wheels; Windmills; Steam Engines; Machines for Rubbing, Crushing, Tearing, Pressing and Condensing Building Materials, &c. &c.

Construction of Railways—

Works under ground with Bridges over; Works above ground; Ascents and Curves; Optic and Electric Telegraphs; Precautions against Snow and Quicksand; Stations, with all Buildings belonging; Plant and Rolling Stock.

III. BUILDERS.

The same II. A, 1, 2, 3, 4 and 5, reference being made when required to the points mentioned sub I.

The examination in Mathematics will not be confined to mere theories, but special cases will be given, the treatment of which will show whether these theorems are clearly understood.

One Week will be devoted to Exercises done in private; on the first day, a Sketch must be handed in, the chief outlines of which must be adhered to afterwards.

CONSIDERATIONS UPON SOME OF THE OBJECTS CONNECTED WITH ARCHITECTURE IN THE EXPOSITION DES PRODUITS DE L'INDUSTRIE, AT PARIS, 1855.

By John W. Papworth, Fellow.

Being Extracts from a Paper read at the Ordinary General Meeting of the Royal Institute of British Architects, November 5th, 1855.

With the same view that the results of investigating the productions connected with architecture in the Exhibition of 1851, were submitted to this Institute by the proposer of that step, he has now the honour of presenting his impressions as to similar objects in the Exposition of 1855: but the duty will this time be less completely performed; because there was an absolute impossibility of seeing (not merely looking at) every thing in the short week which he could devote to it, as well as because under that circumstance, the observer goes to such an Exhibition with impressions already formed, and cannot dwell long enough, except in very peculiar cases, upon single objects to modify the opinions with which he is prepossessed. To have dealt satisfactorily with everything relating to our profession in the various buildings, would have required a corps of architects: the building contrivances appeared to be comparatively few in number, and collectively of little value; and, therefore, these remarks will be chiefly confined to the materials and the taste shown in decoration.

As a general idea of the contents of the Exposition, it may be stated, that the number of exhibitors from—

France and its colonies, amounted to about . .			10,691
England	1460		
Its Colonies	985		
		2445	
Other countries		7574	
Of which—Prussia, 1313; Austria, 1296; Belgium, 686; Spain, 568.			10,019
			20,710
In 1851, about . .			17,000

The French classification of the Catalogue, as ought to be expected, is a refined one, but less suited to the ordinary observer than that of 1851. The Catalogue of 1851 was best fitted for an exhibition, that of 1855 for a museum; and something better might be made from a fusion of the methods. Those who understand the effect which is produced upon the public by the information that distinctions have previously been awarded to the producer of the articles at which it is gazing, will certainly regret with me that the English commissions did not add to the names of their exhibitors a list of previously earned distinctions. In the foreign divisions, the Exhibition medals and notices of Berlin, Berne, Dresden, Florence, Genoa, Gotha, Lausanne, Leipsic, London, Munich, S. Gall, Turin, Vienna, and of France, of all time that any exhibitor could claim, were paraded, and with no slight effect.

The *service du Bâtiment* comprehended the design and general arrangement of the buildings externally and internally. The chief names which appear in the official list under that head, are those of MM. Vaudoyer, as Commissaire; Rossigneux, as Commissaire adjoint, with the special care of the decoration; De Crémont, as Architect, with the maintenance and decoration; and Trélat, as Architect Engineer, with the maintenance and decoration of the gallery (the annexe) on the quay. But I cannot suppose that it was owing to these gentlemen that so many architectural models and designs were not in the Exposition des Beaux Arts; an arrangement which caused several meritorious productions to be lost in the crowd of manufactures, and too many of them in the darkness which prevailed under the galleries. It would be in some degree unfair to compare the Oriental divisions, as to their cases, with works which have lately been executed here; they bore the impress of haste, although attractive at the first glance. Those to whom the idea occurred of placing the models from Sunderland (of vessels) in glass cylinders, deserve praise for the elegance which their invention displayed. The cases for the Glasgow goods were pretty, as were the stands for Bennett's watches and Claudet's photographs, but I guessed that they were French productions; as well as the Viennese cabinet of drawing materials, and the handsome bookcases (Renaissance style) in the French department of stationery and printing; the stall of the Imprimerie Impériale, which had a back-board covered with green velvet, and surmounted by a grand cornice with a bratishing upon it, was of course a French production. The very good Elizabethan case, a frame on brackets, for the woollen stuffs sent by the Commission Royale de l' Agriculture of Wurtemberg, was one of the best cases in the building; and the bamboo stall, 20 feet in diameter, of the Société Néerlandaise de Commerce, was pretty. The Prussian zinc work and the Austrian electrotyping, will be named. The Australian book-cases, if made by Marsondet and Son from a design by M. Semper, were certainly not creditable to the skill of either the designer or the manufacturer. The English fittings in 1851, presented a great contrast to those on the foreign side, where government authorities did almost everything for the exhibitors, and massed their work in decorated and darkened apartments; but in 1855, the rule was darkness: and this was the more to be regretted, because a general effect of uniformity was produced at the cost of the brilliancy of the productions. The passages under the galleries were so narrow and so gloomy, that visitors were glad to keep out of them and stay in the body of the building, although that also had the effect of being filled with articles huddled too closely together. Very few market prices were affixed in the Exhibition, although information of that sort was invited; and it was impossible not to observe, that where articles were marked with prices, and as "sold," they chiefly belonged to one of three categories—cheapness, trifling prettiness, and direct imitation of natural objects. Thus, the cheaper objects produced by the electrotype process, although not in good taste—the library chairs (upon English models) from Hamburgh,—and the English flower stands, fenders, scrapers, umbrella stands, knockers, and hat stands, were so marked; as well as a majority of the pretentious littleness which was to be seen throughout the building. It seemed that nearly all objects of direct imitation (as sculpture) from nature were sold, however they might be colored, or whatever their material might be; for instance, a bundle of blue canes as an earthenware garden seat, or three apparently leather cushions piled one upon another, in the same material; as well as umbrella holders of birds, cupids, and dogs; plates of leaves; heads of animals as brackets, and many more. Next in attraction seemed to be the objects of every kind in the very simplest condition, such as the productions of Wedgwood; and following them the style de la Renaissance—rarely pure, but mixed with positive Gothic, or with servile copies from nature, or with both—was so prevalent as to seem the fashionable style. This mixture of various styles in a single work was so frequent as to create a feeling of dissatisfaction generally. For what it sent, Spain exhibited as little of this fault as any country; the tables and chairs from our Indian possessions were, as on a former occasion, remarkable for their adoption of styles foreign to the native school, and the spirit correctly infused into them; Belgian industry seemed to exert itself in mechanical rather than in artistic productions, but there was boldness enough in the works produced by Lalmand, of Antwerp, as models for the decoration of apartments, frames, &c. Another Belgian exhibitor submitted a cabinet, costing £260., in a mixture of the Elizabethan and Nature styles, which was spoilt by the insertion of marqueterie representing perspective interiors; the works from the Netherlands were generally rococo but clever; while the Austrian and Prussian tastes were generally poor in effect. I am inclined to place as the first in the whole *Exposition des produits de l'Industrie*, the contributions of the MM. Huber,—they chiefly consisted of a chimney piece and frontispiece over it, in the *style Le Pautre;* but there were other works from the same hand, such as the frame to Delepierre's flowers, which amply refreshed an eye fatigued by the general insipidity and poverty of the sculptured ornament in the Exhibition. Magnificence was also obtained in the bronze pedestrian statue of the late King Frederick William III. of Prussia, exhibited by the Institut Royal des Arts et Métiers of Berlin. The figure is represented in armour, inlaid with pseudo or late Etruscan ornaments in gold and silver; to this more marks of approbation were placed in my note book than to any other work which I shall have to name; its effect was not quite paralleled though pursued with much taste by the ecclesiastical dresses from Brussels, the *manteaux de cour* of the Compagnie Lyonnaise, and the pseudo Etruscan embroidery of gold upon blue cloth, sent from England. The two Zuloagas of Madrid stand in my estimation in the next place, for the beauty of design and excellent execution of their armour and other objects in wrought and chased iron. The grand fountain by Barbezat, and the Greek candelabrum by Siegel (correct but not spirited), deserved especial attention; and the exhibition of fifteen sun-dials upon various parts of one pedestal, by Le Tessier of Plessier Grammoire, planted out in the open air where few could remark it, shewed that an almost obsolete branch of science is yet cultivated in France.

The display of natural resources in stones, limes, bricks, slates, and woods, from Australia and Canada, was too important to be passed unmentioned, although I had no opportunity of studying them. I cannot refrain from expressing a hope that our Government will see that it is its duty to endeavour to place those collections in England.

The further course of these notes may be divided into seven portions: the first consists of observations on the use of materials which come within the province of lithology, the second of observations on the application of metals, the third will treat of the use of wood; and then passing slightly over some products of the animal kingdom as applied in manufactures relating to building and decoration, we shall speak of the few building and other contrivances, of the models, and of the Exposition des Beaux Arts.

Putting aside the rich and numerous Australian collections of Mr. Clark and of Mr. Macarthur, and the good collections of small specimens of marbles from Portugal and Tuscany, it will be found that Greece and France produced the chief specimens of marbles. Porphyrite from Crocæa, Rosso-Antico from Damaristica and Cynopolis; Agate-breccia from Xilokeratia; breccia from the Taygetus; the amygdaloidal marble of Parori (Sparta); cipollino from Pyrgari in Lageia; the black marbles of Mantineia and Laconia; the green marbles of Tænus; the red marbles of Cape Tænarus; marbles and breccias from Nauplia; and alabastroidal marble (of which it is said that antique lachrymatories were made) from the island of Psythalia (Piræus); are the names found in the collection forwarded by the Greek Government.

Dervillé and C^ie^ sustained the honour of the French marbles by the collection of fine specimens, of no small size, shown in 1851; and their efforts were seconded by those of Millardet and C^ie^ and of more than forty private exhibitors, of whom ten showed marbles worked up as chimney pieces. This number does not include an interesting collection of the marbles of Corsica; a translucent onyx-marble from ancient quarries at Aia-Teébalek, near Tlemcen (Algeria); a fine marble table of the grey red-veined marble, called rouge-royale, from the quarries at Franchismont; another of a marble from the quarries of S. Hubert, at Roquefort (Luxembourg); nor the ornamental columns supplied by Geruzet. Two productions should have stepped out of the pale of manufactures into the domain of art; one was a clock case, 18 in. by 18, with three groups, costing £80., by Dubois; the other was a white marble vase, 24 inches high, and 12 inches in diameter, at the same price, by Margas; it was a beautiful, yet bold, Roman design, with flowers extremely well executed. A chimney piece from the same firm was of nearly equal merit, and was the best of the French chimney pieces, which were of a higher class than those sent to this country in 1851; and showed that the mouldings of Vignola are the best suited to the colored French marbles. There were also some very good second-rate chimney pieces, especially one which was marked as the pattern approved for the Mediterranean steamers. Besides the works of three other Belgian exhibitors, there were several chimney pieces exhibited by Leclercq, which were sold—in marbre Napoleon, a grey marble from Boulogne; in brocatelle brun from Dinant, and in Siena (at £84.); the two last being better than a white Carrara marble (at £360.)—The green Connemara marble, exhibited in the English division, appeared to advantage. Tuscany, as might be expected, stood first in the display of the inlaid work, called Florentine Mosaic. Mention should be made, for its size, of the great vase, 5 feet in diameter, and 12 feet high with its pedestal, sent from Bagnères de Bigorre; and a stone, called Portland-stone, from the estate of Portland, in Jamaica, was shown, as turned by common wood cutting tools; there is a similar stone in that island called Southampton-stone: the even texture and extremely clean arris which work in this material presents, would indicate the probability of its introduction here for decorative work. Wurtemburg sent a fine collection of building stones; Cologne Cathedral some work out of the mason's yard over-labored and refined; and Austria a machine for making tubes of stone, a fallacy exploded here fifty years ago. Fourteen establishments contributed specimens of slate raised in France,—there was nothing in these collections remarkable; but I was unprepared for an exhibition of Italian slating: the slates from Sweden seemed of good quality. The English enamelled slate was a specialty. The French division contained about thirty exhibitors of cement and artificial stone; Portland and Roman cements would seem to be equally well known by name on both sides of the channel; and it is remarkable that only half that number exhibited limes, while only five showed plaster. The French scagliola-work appeared paler than such work in England; and, I may add, that my hearers will find that this paleness, the effect of white, is common to every branch of colored continental manufactures. The vases, 30 inches high and 14 inches wide, in a Greek taste, made of chunam in India, were very remarkable.

To say that the twenty French and two or three other exhibitors failed miserably in their painted and stained glass, is only to express the opinion generally pronounced: it is easy to dismiss a whole class with a contemptuous sneer, but it is the duty of those who pronounce such a decision to be able, if not willing, to give the grounds of their decision. The following reasons guided my own judgment. In the class of flashed glass simply, the glass was washy, if there was any pot metal it had the same defect: the artists of the Mediæval ages were so far fortunate that their material, *even when unstained*, was translucent, but only semi-transparent, and therefore looked substantial:[*] their followers enamel the present transparent glass in imitation of the dirt of ages, which they seem to fancy gives that *solidity* to ancient glass: the fallacy will be evident when it is considered that they seek a "transparent dirt;" and that the semi-transparency of ancient glass is easily ascertainable. As a general rule, the modern works in the Exposition were too much paintings in the strict sense of the word; those artists who age their glass are obliged to cover it with enamel, to put shadows, hatchings, anything that will break the washy appearance of their material, or else to paint it entirely in enamel: this accounts for the prevalence among the exhibitors of imitations of the glass painting style of the fifteenth and sixteenth centuries, and the grisaille-work of succeeding times: but the public says "this is not the lustrous effect of old glass:" those artists who do not age their glass are told by the same public, "this is tame in comparison with old glass," and the public, without knowing why, is right in both cases. The host of ecclesiologists who besiege our glass painters, torment them fairly enough with the dilemma; from which some of the painters have ingeniously relieved themselves by the expedient of servilely copying some celebrated examples, which are of course irreproachable, and then retaliating upon their critics, "this is an exact copy of your ideal, can you object to it?" The critics, unless prepared to say that the painter cannot even copy, dare not raise a further objection; there is no blame to be thrown upon novelty of design, or excellence of drawing; and thus we may account for the prevalence among the exhibitors of imitators of the stained glass of the earlier periods. Colored glass windows, to be really effective require few qualities, yet they are hardly to be obtained. Solidity of material I have already mentioned; purity of colour remains to be achieved: and when that part of the restoration is accomplished, good drawing will have to combat with the prejudices of this enlightened age, which praises Pre-Raffaellism and manufactures Pre-Cimabuity. What does the friend of Raffaelle and the pupil of Michel Agnolo say? Cimabue was a pupil of the Greek masters, who executed "figures with senseless eyes, outstretched hands, standing on the points of their feet.". He departed from the dry formal manner of his instructors, giving "more life and movement to the draperies, vestments, and other accessories, and rendering all more flexible and natural than was common to the manner of those Greeks, whose works were full of hard lines and sharp angles—and this rude, unskilful, and common-place manner the Greeks had acquired, not so much from study or of settled purpose, as from having servilely followed certain fixed rules and habits, transmitted through a long series of years by one painter to another down to those times, while none ever thought of the amelioration of his drawing, the embellishment of his colouring, or the improvement of his design or invention." But Cimabue drew from nature, a new thing in those times, says Vasari; and I may say almost unheard of in glass painting at present. It must suffice to say that some glass painting executed for the Church of Notre Dame at Montbrison, having good modern figures with the drawback of bad color, was exhibited; that the grisaille work was not bad; that an English modern window had the good idea of a lace glass with medallions of arabesque and Renaissance ornament; and that the prices of one manufacturer were per foot square, Grisaille and Byzantine work, 4s. 9d.; modern pictures, 8s.; 12th and 15th century work, 9s. 6d.; 16th century work, 12s.; partly modern and partly ancient, 10s.; glazing, 7½d. or 8d.

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[*] Information given by C. H. Winston, Esq., Hon. Member, R. I. B. A.

The Portuguese porcelain and china ware was good; the great Sèvres Etruscan vase was pale and washy, but remarkable for its size; the Austrian (Hungarian) china was designed with shocking want of taste; chairs of fine earthenware are, I believe, a novelty, they appeared in company with the renewal of a fashion long gone by, viz. the style of vases, ewers, &c., apparently tied in by a string, and left so to dry before firing, this fashion prevails in most French factories; very fine large vases and other utensils from Limoges, the superbly tasteful white utensils exhibited by Jacob and by Ristori, somewhat similar articles by seven other exhibitors, and some sharply modelled china by Schmidt, of Aix-la-Chapelle, formed a large and inviting field for the study of ornamental outline. The fine Swedish earthenware, Ridgway's wash-hand basin, "lavabo" as it is called on the Continent (sold), the plain red and black pottery, the plain ware and Etruscan of Wedgewood (sold), and the fine earthenware stoves from Zurich in a severe Greek taste, excellently managed except for quatrefoils with Italian details, attracted considerable attention. The Swedish earthenware stove-cases were not good. The English pottery vases were equally conspicuous for wretched design and execution. The terra-cotta adjuncts to building purposes were numerous. Fine sharp architectural ornaments in this material were sent from Westphalia, Winterthurm, and Wagram. Large terra-cotta articles, 24 inches square and good, were sent from Karamis in Belgium; and the largest figures in the Exhibition of this material were sent with ornamental works, by Gossin fils of Paris. Thiry of Paris, and Miesbach, of Vienna, occupied places for figures, vases, balustrades, &c., only inferior to Follet, who sent excellent vases in a Moresque Greek style, and to Garnaud who showed architraves, pretty vases and balustrades; his pattern book is worth inspection. Besides Clayton's brick and tile machine (bought by a member of the Jury) which attracted great attention, and that sent by Whitehead of Preston, there were twelve similar machines in the French division: five exhibitors sent French bricks, and small cement and beton blocks: and there was a large collection of Dutch bricks. Earthenware pipe tubes were not very numerous. The façade built up of his own bricks and tiles, by Borie, made a very pretty architectural display, and was a good lesson in ornamental brick-work. The Florentine tiles appeared to be very good. Madrid sent some pretty and large tiles; there were also very large tiles from Holland; foot tiles, double with cross holes, and earthen sieves. France possessed fourteen exhibitors of tiles in different materials, as clay, glass, iron and cement, and of varied manufacture, encaustic, and in low relief, for paving, &c., for stoves, &c., in the old Renaissance style, and for roofing in many patterns.

In the application of ornamental and sculptural art to the purposes of the goldsmith and silversmith, the English specimens certainly carried off the palm in the estimation of the visitors. Several called my attention to the display made by the Goldsmiths' Company, but it must be confessed that I saw with much more pleasure the exhibition supplied by Messrs. Garrard. A great improvement has been visible of late years in silver work, especially in the styles of Adams and of Flaxman (Etruscan), and the statuettes are not so large. The piece of Moresque gold work for the Queen commanded attention, as did also the cup made by Messrs. Watherston and Brogden; the last seemed more properly a piece of goldsmith's work; the other, from its style of design and size, appeared more valuable as a quantity of metal than as a piece of art; for the more nearly the two values approach each other, the more likely is the labour of the artist to be disregarded, or rather lost in the feelings excited by the material upon which he has worked. Where ornamentation only was employed, the French department, with its delicate and highly finished modelling, stood in the first rank, the parts being larger and the ornament smaller in proportion to the general design than in the works of other countries. I need only mention the Queen's candelabrum, exhibited by Messrs. Elkington, as a proof of the justice of these remarks, which apply in our own profession. Amongst the French productions was an ornamental tablet, valued at £4000., which appeared very satisfactory, and an object of somewhat similar character was furnished from Berlin. The silver gothic chandelier and the crosses from Spain were excellent. The French works generally were scarcely inferior to the rich productions of Maurice Meyer, except in perfection of execution, or to the jewellery work of Beaufour Limonnier, except in regard of the generally good and simple taste therein exhibited.

A very large number of articles in bronze seemed to have affinity with the productions of the silversmith. It would be unfair to rank as works of mechanical art the copies, half the size of the originals, of the gates of the Baptistery at Florence, which we already knew; or the productions by Lechesne, which combined the style de la Renaissance with the direct imitation of nature. The busts exhibited by the Fonderie Barcelonaise, were the most sharp and highly finished bronze castings that I had ever seen, except those from the foundry of the Spanish Government at Trubia, in 1851; they were scarcely equalled by a well-modelled and cast font for Copenhagen, and by the works supplied by Kitschelt of Vienna in the usual mixture of the Natural and Renaissance style. The other works of importance in this compound were French, but the workmanship only was excellent. The well modelled and sharp though not highly-finished Renaissance candelabrum, by Labroue, and next to that the productions of Lacarrière, took precedence in the French division. Mention should be made of the gothic church chandelier for fifty lights, exhibited by Carrier-Rouge of Lyons; it was, however, not well or steadily put together, and was hung too low to show to advantage.

There were many pretty portions of iron-work in the Exposition: for example, the standards to the Coalbrook Dale Company's stalls; and the signboards, &c., sent by Bouilliant, Dupont and C^{ie} of Evreux; but the first rank in ornamental ironfounding was occupied by a cast-iron pyramidal monument, in a good German taste, sold for £140., and by the gratings, the fans costing £3. each, and the castings from embossed lace papers, exhibited by Count Stolberg Werningerode; next in rank would be the Eisenwerk Lauchammer, Saxony: the works of Barbezat and C^{ie}, for iron and bronze castings, of Colas Frères, and of Muhl Wahl and C^{ie}, whose works in the Place de la Concorde are so well known, stood highly in my estimation for taste and execution; with them may be named Eck and Durand, who exhibited, besides a kneeling figure of a princess of no great merit, several fine lamp posts; and Calla, who also sent six fine lamp posts. I particularly name the last two firms, because a member of our profession, whose name I have forgotten, was asking me before my visit the name of a manufactory in which he might find a good selection of handsome patterns for that extreme difficulty—a street lamp-post. The best piece of plain French iron work, on a large scale, was a field gate, in the open air out in a corner of the Exhibition precincts; iron gates also in the open air, an iron fountain in the mixed styles of Nature and the Renaissance, and a pretty railing, claimed particular attention; but their interest was much inferior to the wonderful wrought-iron hinge-work, and similar productions, especially a piece belonging to M. Viollet Leduc, which, if modern, was the best of the sort that ever came under my inspection; the name of the producer is Boulanger, of S. Denis.

The Intendance Royale des Mines et Forêts du Hartz, Hanover, exhibited statuettes, 24 inches high, of the Apostles, for £15. the set; and also a Caminofen, modelled by Halzemann, which were as excellent of their kind as the other productions from the same establishment were poor. Hanover also sent iron tubing, in lengths of 56 inches each, glazed externally as well as internally. The Swedish iron and steel work was fine, and the castings from Liège were superb in style and execution. Belgium shewed iron plate, stamped with excellent effect, as in 1851, but the iron-work from the Netherlands was neither well modelled nor sharply and cleanly cast; the same bad taste as in its jewellery prevailed in the stamped iron plate from Prussia, which, mechanically speaking, was good. I was surprised to find Florence in the list of cities distinguished for iron casting,—two turnscrew staircases, one with wooden treads, a superb balcony-cantiliver, a lamp-bracket, and a handsome railing, were all of at least the second rank. In 1851 notice was taken of Austrian iron post paper, in the shape of remarkably thin sheet iron, and of Prussian zinc, not thicker than common writing paper. This year France has added brass as thin as tissue paper. It may be a question whether covering wood-work, for example a cornice, as at Berens and Blumberg's in St. Paul's Church Yard, with these substances, would be in conformity with the use of fire-proof materials required by the Metropolitan Buildings Act. The collection of English iron-work was not satisfactory. The design of some of the Canadian stoves, and the carving of their patterns, with castings by Rodden of Montreal, were superior—but their joiner's ironmongery inferior—to the average specimens in England. Some of the English firms which ranked highest in 1851, did not support their previous fame. The chairs exhibited by the Coalbrook Dale Company, in a sort of Moresque Renaissance style, were tolerably good; and the pair of gates, priced by Cottam and Hallen at £240., were fair but flat. The best of this class was Bailey's fine grille. About a dozen plates of iron produced among seven exhibitors by various processes were from $\frac{2}{12}$ to $\frac{5}{8}$ in. thick; from 1 ft. 4 in. to 6 ft. 6 in. wide, and from 14 ft. to 39 ft. 8½ in. long; between 65 ft. and 136 ft. 9 in. superficial, and from 692 lbs. to 3417½ lbs. in weight.

In zinc work, France was chiefly represented by the Vieille Montagne Company and by Baudoin. The latter firm exhibited a handsome hipknob, 4 feet high, price £16., sashes, ornamental roof work, vases, &c.; but the Prussian zinc-work was, as heretofore, more agreeable to me. The pretty—whatever a great English authority might think of the application of certain outlines and details—gilt and painted zinc Mauresque stall belonging to De Diebitsch, of Berlin, was full of apparently pretty things. The minor works in metal deserving mention consisted of wire seats and tables for use in gardens; square-bodied patent metal tubes; the imitation of bronze articles submitted by Dubois and Soulais, which were good in execution but selected with less taste than was desirable; and the electrotyped frames of the productions sent by the Austrian Imperial Printing Office.

The collections of useful and ornamental woods were numerous and magnificent; Tuscany, the Papal States, Spain, Venezuela, the United States, Sweden and Canada were among the minor exhibitors; Greece and Australia were among the largest. Among various treatments of wood were injection; anticorrosive coating; large panels rendered invariable for painting, coach-making, and furniture; and thin sawn wood *(feuilles de carton bois)*; and Bavaria showed pine wood cut into 30 leaves in the inch, and mahogany cut into 11 leaves in the half inch. The number of exhibitors of wood carved as decoration or furniture was very considerable (214). England sent the greatest number 56, France 47, Holland 18, Denmark 15, Tuscany 15, Sardinia 14, Sweden 10, Norway 7, Prussia 7, Belgium 6, Bavaria 4, Switzerland 5, Spain 5, Austria 2, Baden 2. The carving bestowed upon these works was in general mechanically good; the taste of the ornament is all I shall have to mention after noticing the delicate workmanship of Knecht, Planson, Lagnier of Bordeaux, Guéret, Tweedy of Newcastle, and Wallis of Louth. The Canadian furniture, with much introduction of natural objects, was excellent; the rocking and Windsor chairs all sold from their cheapness: the very handsome wardrobe, by Roehr of Prague; the light and excellent chairs and furniture by Thonet, of Vienna; the ingenious expanding table by Boulfray; the Piedmontese billiard table, of a good sarcophagus design; and a chimney piece, by Fourdinois, costing 1920*l.* leave me to speak of the expensive bookcases, wardrobes, and sideboards, at prices varying from 800*l.* to 220*l.* Guala, of Turin, exhibited a good pattern of a carved roof, and handsome handrails; Ringuet le Prince, of New York, exhibited a sideboard in the Renaissance and Nature styles, which had much merit. Zora, of Turin, exhibited some of the best chairs, and other good furniture, with which might be ranked the Florentine and Sienese works. Cruchet's fine frontispiece of game, Jeanselme's bookcases, and Beaufil's, of Bordeaux, walnut bookcase, were probably those seen in 1851. The Emperor had purchased three cabinets or bookcases, and had certainly been well-advised. The English productions, scarcely visible under the galleries, the French Renaissance walnut-tree bookcase by Klein, the bed and glazed wardrobe, by Semey, the walnut bookcase of Wieber, Pitetti & Co., and the pear-tree escritoire by Gueret, who is also mentioned as a carver of small articles being imitations of natural objects, like Michaud and De Villeneuve, who send a frame exhibiting the best wood carving of the natural style in the French division, conclude my list of furniture.

The merit of design in piano-fortes rested with Hughes and Dunham, and Hopkinson, in the English division; and with Hornung and Muller, and Sōrensen, of Copenhagen; they sent pretty cases, and the best as being the simplest: but the Swedish cases were trifling, like those from Hamburg, which is surprising.

The eighteen French, six English, and some Genevese manufacturers of paper-hangings, did not present anything which seemed peculiarly meritorious; for mere paper, Pirie, of Aberdeen, was considered by some French connoisseurs to show the pearl of the Exhibition. The specimens of parquetted floors, from all parts of the Continent, at about 10d. per foot superficial, were numerous as might be expected; it is hardly safe perhaps to judge from the examples exhibited, but those made of small bits split terribly, large bits stood better. The employment of caoutchouc, which was honored by a medal in 1851, has considerably increased. The taste displayed in picture frames and pretty ornaments, polished like jet, was of a high order, and creditable to the exhibitor Charles Goodyear.

Ivory, as a material for carving, appears to excite much attention in France—the large Renaissance casket, by Moreau, deserved much praise; as did the Renaissance casket, 9 by 4, in one piece, by Hebert, costing £40. In ivory turning no difficulties seem to exist; unless a mistake has been made, one cup was 6 ft. 7½ high, by 1 ft. 11½ dia. At least ninety-eight exhibitors in wood or ivory turning, and thirty-six others in fans, canes, sticks, parasols and umbrellas, sent their productions; among them, Collette was really conspicuous for the artistic merit of his sticks, finely carved and headed, at the price of £8. each. There was one remarkable exhibition of leather for decoration. Dulun asserts his enrichments to be 200 per cent. cheaper than wood; his hangings cost from 5s. 6d. to 12s. 6d. per yard, according to their richness; and chair coverings 4s. to 7s. each. An imitation of these hangings was charged at 1s. 6d. per yard. The imitations of wood in graining from Toronto were excellent, from France good, but both Moxon and Kershaw stood in the first rank for marbling and graining. Two French tradesmen observed that the work of the latter (grained and imitation inlaid doors) had no chance against so much that was real, and that the work of the former only required patience, which no Frenchman would condescend to give to the work. Two hydro-fuges, besides Claudel's coating for decoration and fresco painting, (apparently excellent); mastic hydraulique, Laurent-Machabée, 45, Rue de Vaugirard, (also apparently excellent,) and the process of Lebrun of Moissac, viz. "ineffacable coloring on stucco" were worthy of observation.

Seven French exhibitors supplied draining instruments and tools; seven others exhibited sawing and mortising machines. The great crane employed in the execution of the building, and two machines for breaking stones (*mortier concasseur*) for roadways, were simple and ingenious. The *psalizometer* was a sort of bevel equally useful in the *coupe des pierres*, or in the *coupe des draps*, for which last it was invented. The Austrian carpenter's bench was not a bad one; it would be worth the trouble of some society to have one in England for exhibition to the builders, the price of one highly finished being £1.; it was exhibited by Wertheim of Vienna, whose collection of tools was very complete and interesting; his catalogue should be obtained, for everything seemed of the most improved shape, and of good quality. The Prussian tools were far inferior in appearance. All the American moulding planes were sold; the profiles would have been good, if they had not been so very mean; this is a vice which seems prevalent in the modern buildings at Paris, I mean those erected since 1840, as they appear to be treated with less boldness of projection in details every year; this may account in some degree for the mania of polychromatization. The Canadian joiner's work looked at first sight fair, but on consideration it was machine-work to a considerable extent; and the material required to be cleaned, according to our notions, before the priming coat could be laid. The stuff seemed rasped, with little hairs of the grain of the wood standing out. An 1¼ four-panelled door with ogee moulding on one side, and a 5 inch two-faced bead ogee and square architrave with plinth, was marked at 15s., which has been called very cheap by some periodicals ignorant that a better article, under the same conditions, can be got here for the same price. The two best examples of French joinery were contributed in a window, by Bernard Hoen; the other in a ratchetted bookcase, made by the pupils of the Institut Imperial des Sourds-muets at Paris. Three French manufacturers had given their attention to scouring papers; granite, lava, emery, glass, flint, silica, and porcelain are the articles employed upon cloth or paper for polishing. As to large bellows, the only specimens I saw were made in England. The door-springs by Renaud of Paris (rue Pétrelle, 22) appeared to me to deserve the attention of our manufacturers; they occupied only the position and the usual appearance of the hinges. The merits of the different French systems of sashes and sash-fastenings, with sun shades, both internal and external, were beyond the passing observation of a stranger to their usual mode of manufacture.

There was considerable novelty and merit in the seven systems proposed for the construction of wooden pulpit staircases or vices. They were on three principles, viz. with a solid newel, like the usual iron ones; with an open well-hole, the carriage being an iron plate; and with a continuous writhed string, which was much the most curious and the best looking; the steps had no risers shewn in the full size specimen exhibited. A double staircase was, if I remember rightly, also exhibited.

The prices of old bells recast, seemed to be 3½d. per lb., of new bells 14d., and 2d. additional for their mountings. There were several expensive contrivances of wheels and pinions for facilitating bell-ringing; but Besson's bells were very remarkable on several accounts. He claims the merits which follow on the adoption of the late improvements of the bell being turned in a lathe; on the power of lengthening or shortening the clapper, and on the details of hanging the bell; but the portion which most engaged my attention was the gudgeon and its seat. The seats, *coussinets articulés*, as he calls them, from £1. per pair upwards, are a variety of the knife-edge balance; the ease which they give to the ringer is such, that with one finger on a whipcord fastened to the wheel, he rings a bell of about 6 cwt.; and on asking him the number of men requisite to raise a bell of 15,000 lbs., he answered that two could do it if the bell were on these seats. Bells mended by Delcroix Mangin of Chalons-sur-Marne, and bells cast of steel at 8d. per lb., attracted much notice.

The employment of resin in making artificial stone; paper covered with composition to imitate slate, stone, &c.; and calico soaked in marine glue for roof covering—were French inventions; while asphalted millboards, said to be incombustible, and artificial slate for drawing board, were Austrian productions. Publicans' fittings and asphalted felt were only forwarded from England. A cap for smokey chimnies from Poitiers; thirteen French water-closets, which I did not examine, as they were in the division of Pharmacy and Surgery; three fire escapes, in the shape of ladders, and one in that of a box of carbonic acid gas; two street sweeping machines; as many chimney sweeping machines; and speaking tubes (which appeared to be a novelty and source of amusement to the French public,) complete the subjects of this class which I have to name.

There seems to be no good reason why all the architectural drawings, if not the models, should not have formed part of the Exposition des Beaux-Arts. The design of a college at some place in Canada, by Kivas Tully; Welland County Court House, by J. Gillespie; and the City Hall at Toronto, which give evidence of the existence of a really good school in Canada, were hardly distinguishable in the darkness under the galleries of the Exposition de l'Industrie. The architectural models were almost entirely from France and England. The former, from the stores of the Ministère de l'Agriculture, du Commerce et des Travaux Publics, contributed Pont Napoleon over the Seine at Berry, built by Couche, for a railway as well as for carriages and passengers; Pont d'Arcole over the Seine at Paris, built by Oudry; Viaduct Bridge at Dinan, over the Rance, designed by Reynard, built by Mequet and de Gayffier; Railway Viaduct Bridge at Tarascon, over the Rhone, built by Talabot; another at Arles, over the Durance, built by Talabot; another over the Bouzanne, built by Borrel; another at Asnières, over the Seine, built by Flachat, and the Aqueduct of Roquefavour over the Are, built by Montricher. Private exhibitors contributed the model of the metal Cupola of the Observatory at Paris, as in 1851; the Viaduct of five arches, each 131 ft. 3 in. span over the Rhone at Lyons; Marseilles and Toul Cathedrals; the Church of S. Jean des Vignes at Soissons; and Polonceau's Roof over the Station at Versailles, of the Rive Gauche Railway. From Switzerland there were some pretty models of chalets. In the English department there were models of the New Market at Holloway, by Bunning; the Victoria Bridge (stone) over the Clyde, at Glasgow, five arches, 1851-54, by Walker and Burgess; the Suspension Aqueduct at Stanley, near Wakefield, and a Bridge at Leeds, by Messrs. Leather; the moveable Viaduct at Ulverstone, and a Bridge by Brunlees; and Mr. Lassell's iron revolving Observatory Dome, at Bradstones, near Liverpool. India sent the model of the Roofmuttee Mosque, at Ahmedabad (1499 A.D.) From Canada there were several models, viz. the Brock Monument, on Queenstown Heights, Western Canada, 185 feet high, which is a composite column, by William Thomas, architect, at Toronto; the Court House at Montreal; and the celebrated Victoria Box Bridge across the river St. Lawrence, at Toronto. Besides these there were several specimens of ingenuity—such as an idea of ventilation by means of ceilings decorated with deep girders; a balustrade and stirrup for an iron bridge; a design for a railway station roof, made with trellised laths caught in by rods everywhere, apparently good for iron construction; and the fine model of the roofs, 60 ft. square, over the workshops of Nepveu and Co., at Clichy. This model, presented to the Conservatoire des Arts et Métiers, where it should be studied by travellers, was the only example in the Exhibition of the modern style of framing roofs as practised usually in England.

Several self-subsistent pieces were in the collection: it is to be regretted that they were so deficient in success. Among the best was one altar and doorway, by Gates and George, of Caen; a fountain aviary, by Tahan; a surprising open oak-work shrine, costing 200*l*., by Dumon, of Bruges, in a German Gothic style; and a rich German Gothic, but badly put together oak altar, by Goyer Frères, of Louvain, at the same price. The frightful pulpit (oak), labelled as executed under the superintendence of the Abbé Choyer, Directeur d'un Etablissement de Decoration Religieux, at Angers, accompanied by an altar nearly as bad, were very inferior to the other French altars; the pulpit and canopy with winding stairs poorly executed and not in the best possible taste, costing 520*l*., by Veneman, of Bois-le-Duc; or the oak altar, second rate, by Prang, of Munster, price 140*l*.; all which were eclipsed by the very correctly detailed altar piece of copper and silver gilt, designed by Viollet le Duc, I think for Bachelet. The terra cotta altar piece for the church of Maison-Rouge (Seine et Marne), by Debay and Co., would be placed by me in the first rank of those exhibited.

A complete copy of the Bauzeitung, I did observe, but there was no English journal relating to our profession, no Civil Engineer, no Builder, not even an Art Journal. One architectural publisher at Berlin, sent upwards of fifty works, but no other exhibitor emulated him: I presume these books were only admitted as specimens of typography; they included the Prussian Government work on decoration, and Salzenberg's Agia Sofia. Sixty-four French designers for manufactures were allowed to exhibit their skill, and they furnished one of the most interesting of the galleries, in one of the most conspicuous places; four Belgian, and one English decorative artists were lost among the goods in the back grounds of their respective countries. Such is the difference to be expected between the two leading countries which manufacture decoration; in one the Empress has the *designs* of her shawls and dresses submitted for approval; and the Emperor purchases the only good thing, but it *was* good, in a poorly furnished stall; in the other, the decorative arts are so miserably represented by a government department, that it was painful to see how ill-judged an attempt had been made.

This was one of the quinquennial Exhibitions at Paris; as the Exposition des Beaux Arts, due in 1854, was postponed to the present occasion. While the other countries of the world only sent forty-five subjects (and of these only eleven were executed designs), France sent forty-three archæological subjects, twenty-seven restorations, nine projects, and four executed designs, in all eighty-three works; and England sent ten archæological subjects, eleven restorations, twenty-four projects, and fifty-two executed designs, in all ninety-seven subjects. I must add to the French list twenty-six sets of the Grands Prix, making 109 subjects, and giving a total of 251 in the Exposition, where our countrymen held the first rank as designers, practitioners, and artists in water colours.

In the consideration of the awards of the juries, we must recollect that great self-gratulation was originally expressed by the officials at the working of the French system as to awards, which system "*appelle à les recevoir les contre-maitres et les ouvriers.*" I shall be glad to see if that system works well as regards architecture, and shall be joyfully surprised to see if any of our English architects have mentioned conscientiously the *contre-maitres* to whom they have been indebted for such pretty pictures as those sent to Paris on this occasion. Not being an exhibitor myself, I can regret that no academical designs of the present time were sent from England; there are enough in London, to set with humble confidence beside the twenty-six French Grands Prix: but, when I asked in this room the Government Committee whether such designs would be received, and recommended that if they were not, a circular should be addressed to certain individuals, you will recollect that I was lectured for the presumption of the advice. The result has been, that the Committee did send the circular, but did not compliment the proposer of it with a copy; and the French themselves want to know, why the representatives of grand art in English architecture have not exhibited? Those who know anything of the working of an international jury, will comprehend that the disposal of rewards is not likely to be satisfactory to the English manufacturers and artists. Not satisfactory to the manufacturers, because they rarely condescend to the trickery of putting forward their goods at feigned prices; because they trust, without puffing, to the reputation of their firms and to the connection which belongs to it; and because, when they do see something better than their own, they confess the fact with a readiness which does England no little harm upon the Continent, although it is much to their credit as honest men. Not satisfactory to the artists, for reasons common to them and to the manufacturers. Among both classes of labourers abroad, those who deserve well of their country, receive decorations, which form a visible distinction between vulgar capital and talented industry (in one or two countries these distinctions cannot be conferred by the Government of its own accord); and foreigners are not aware that Englishmen cannot obtain permission to wear even the decorations received from other countries. So that when our artists and manufacturers visit the Continent, especially upon an occasion like the Exposition, their foreign rivals glance at the breast of the Englishman to learn at once the mental standing of their guest. No cross, no ribbon, no medal offers itself to view, and they naturally say to themselves, this may be a good man and a rich man, but he has no talent or he would have been decorated like ourselves. I would be thankful to believe, that Sir Charles Barry, or Professors Cockerell and Donaldson, as an acknowledgement of their art, ever wore the gold medal of this Institute abroad, even on special occasions. I believe there are only five Englishmen who at present can show a royal medal for art. All the commendations which you have heard, may not be confirmed by those of the juries; but I expect, that the international juries will bestow their medals for extraordinary cheapness, for extreme beauty of design, for soi-disant extraordinary inventions, and for previously achieved distinction: in which case, we shall probably see, that upon sufficient explanation from their friends, those of our countrymen who obtain the chief honors, will be those who have been knighted at the cost of £300. to themselves, after their worldly success would enable them to disregard so expensive a mark (of royal—not national—approbation,) which is hardly understood at all abroad as being far more than equivalent to the cross of an order, and certainly does not always fall on the right shoulders.

It may be asked, what good has been derived by our profession from these exhibitions? Whatever may be the tenor of the awards of the juries, I believe that two things are clear results. Our employers have had the opportunity of seeing in that France, which is supposed to be their leader in fashionable knowledge, that architecture is not a trade, but one of the beaux arts; and ourselves have had the opportunity of making such acquaintance with the French architecture of the present day, as to demolish much of the tendency to self-abasement before it, which has been too common in this Institute.

AN ABRIDGMENT OF M. LANCE'S ESSAY, ENTITLED "ON A DIPLOMA IN ARCHITECTURE," WITH REMARKS AND SUGGESTIONS.

By John W. Papworth, Fellow.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, November 19th, 1855.

I may be allowed to state to the gentlemen who were not present at the last meeting, that proposing to read it to the Institute, I had the pleasure of presenting "avec l'hommage respectueux" of the Author, an Essay by M. Adolphe Lance, Architecte du Gouvernement, at Paris, entitled "Du Diplome d'Architecte:" and that after the address of Mr. Tite, the President at that meeting, the Honorary Secretaries were so good as to suggest this opportunity for offering to your attention the history of what has been done in France with regard to the important question of which Mr. Tite urged the consideration, viz., the institution of an examination, and of its necessary result, a diploma.

I have endeavoured to give the passages, which are extracted from M. Lance's Essay, as nearly as possible in his own words, and have therefore only to add, that the remarks in italics are either very much abridged from the Essay by M. Lance, or are suggestions for which I alone am responsible.

Legislation on public instruction has undergone, in the last few years, very serious modifications, which seem to have attracted general attention to the question of education as a whole, and also to the questions of organisation which relate to it *in France and in England.* This movement is especially observable in relation to the profession of the Architect *in both countries.* Important reforms in the laws, or in the customs which regulate that profession, had been previously brought forward, *and in England had been partly adopted.* Their object *in France* was to give to the public more positive guarantees of the skill and experience of the artists whose competition that public demands: *and in England, as* well as in France, to give to the body of Architects more unity, more strength, more cohesion, and a more defined, and consequently, more respectable position; so as to ameliorate their worldly condition as managers of a very considerable branch of industry, and thereby to open to Architecture, as an Art and a Science, a more open path in which it might proceed with more consistency, and with a firmer and more assured stride. Such, we say, was the object intended; this is not the time to discuss if the means then sought were those to lead with the greatest certainty to it *in France; it cannot be denied that the establishment of this Institute has done much in this country towards attaining it.*

The notions which were at one time subjected *in France* to searching discussions, and whose realization was pursued in vain with unusual perseverance, though never completely abandoned, appeared for a time to slumber, so much were they laid aside for others causing more general anxiety. At present, if we are not mistaken, these ideas are aroused, and the minds of our colleagues return, with marked predilection, to the study of these difficult questions. It is the general opinion that "something is to be done," and the moment seems favourable for agitating afresh these problems, and for opening the way to a definite solution, whatever that may be.

The profession of Architecture is absolutely free. Whosoever likes may practise; whosoever chooses may call himself an Architect; no one is compelled, in order to obtain the title, to prove before competent authorities that he possesses any of the knowledge requisite for the discharge of his duties.

He is an architect by the same right that another is a manufacturer, a dealer, a speculator in any enterprise; the law supposes that clients find either in private connections, in public notoriety, or in their own discernment, sufficient guides for their appreciation of the skill of those men who represent themselves Architects, and offer to direct the construction of works. An observation in the Dictionnaire d'Architecture, by Roland le Virloys, published at Paris in 1770, is precisely applicable at the present time: "As soon as a man knows a little of drawing, he sets himself up as an Architect. Draughtsmen, decorators, and others of that description, are not the only ones who are so bold. If a bricklayer has built two or three houses, he calls himself an Architect; and forthwith gives plans and designs to all who are kind enough to listen to him, intimating that they will save the small but useful expenditure of the fee due to an Architect; while the real object is only to withdraw from subordination, and exercise the tricks to which the building trades are but too much addicted." *It must be recollected that this is the language of French architects; the English architects have other grounds of complaint; and that the English builders profess to have grounds of counter accusation.*

Is this legal liberty of the profession a novelty? Is it peculiar to our country? Certainly not: for the quotation just given is dated, as before mentioned, in the year 1770; that is to say, at a period when the restrictive system of sworn guilds and corporate freedoms was in full vigour *in France, and apprenticeships in England*, and we know that it was not applied to architects. (*I may observe that M. Lance has not admitted the tradition of the Freemasons into his Essay;*) *but he adds that*, in fact the regulations very anciently imposed upon master builders, and the more special and later institution (*in* 1574) of sworn surveyors, cannot be considered as relating to architects.

M. Gourlier, in a report which we shall have occasion to cite presently, justly observes, "it does not appear that any measure was ever adopted to investigate the claims, more or less founded, which individuals might have to call themselves architects, and exercise their profession. Architecture properly so called, was in this respect considered as a 'free art,' and it was permissible to any one to exercise it at his own proper risk and peril, as also at the risk and peril of those whose confidence he obtained."

Evidently unaware of the Prussian system which Mr. Tite laid before us at our last meeting, M. Lance continues to say that if we examine foreign legislation, it does not appear that it can give any answer other than that from our own country. Everywhere, with a single exception, it is "liberty." At least, the Société Centrale des Architectes, which had maturely studied this interesting question, cites only one country in which the exercise of the profession of architecture is subjected to conditions which are intended to prove the skill of the artists who dedicate themselves to it: that country is Spain; and the date of the institution is recent. The first statutes relative to architects were presented in the last century to King Ferdinand VI. by a Frenchman named Hérard, Member of the Academy of Madrid; and they received the royal sanction. They were modified and renewed 29th July, 1801, by King Charles IV, on the proposition of Don Pedro de Cevallos and Isidore Bosart, also members of that Academy.

From that time the following custom has existed:—No person may call himself an architect, or practise the profession, if he is not affiliated and approved by the Royal Academy of S. Fernando, and if he has not received a diploma from it. This diploma is obtained under the following conditons:—

Production of a document from some architect affiliated to the Academy, certifying that the candidate has worked under him, and is conversant with the practice of building.

Deposit at the Academy of a design, with its working details, an explanation of the proposed mode of construction, and a specification (the subject is chosen by the candidate).

Actual manipulation of a tinted sketch, &c.

Public examination in the subsequent week, for two or three hours, on practical geometry, the theory and the practice of architecture.

Foreigners are admitted under the same conditions. When this diploma has been obtained, the artist may practise at any place in the dominions of his Catholic Majesty. Private persons need not employ an architect affiliated to the Academy, but if they do not, they have no right to enforce responsibility at law. Only architects affiliated to the Academy can be employed by the Crown.

The two systems are thus brought face to face:—the rule of unlimited liberty, without any guarantee of capacity;—the rule of freedom limited by the necessity of satisfying the conditions of skill which a public authority is charged to obtain. Which of these two rules should be preferred? Which of them presents the most security to the public? Which assures the highest consideration to the artist? Which promises the greatest development of the art? Such are the questions which we want to examine and which it is opportune now to agitate. Before entering into these questions, it will be well, and we believe, not without interest, to consider the very anxious, very elaborate, and very noteworthy enquiries which the Société Centrale des Architectes at Paris has dedicated to this subject. A simple analysis, as succinct as possible, is all we shall ask permission to place before you; *as the two countries differ much in their political institutions, so several of the questions discussed by that Société are peculiar to France, and twenty-four pages of the Essay* by M. Lance, must be condensed into as many paragraphs.

Struck with the isolation in which their fellow-labourers were living, and with the danger resulting from that isolation to the profession, some of the French architects proposed in 1840 the foundation of some central body.

At that time M. Gourlier gave his attention to the question of a diploma, which he treated in an excellent report presented on behalf of a committee to the future founders of the Société Centrale. It might even be said that the study of this subject was one of the objects of the institution. . . . . The report shows that the complaints of the architects are long standing ones. It does not ask for the restoration of guilds and corporate privileges, the revival of the defunct *Academie*, or of the corps of sworn surveyors; but it points out the existence of privileged professions, privileged, that is to say, for the public good; such as barristers, solicitors, proctors, physicians, surgeons, apothecaries, &c. The report asks if there is not an evident analogy between those professions and that of architecture, and whether there is not, consequently, a good ground for subjecting the one, like the others, to certain conditions of capacity; that is say, to render imperative the possession of a diploma which shall be a mark of that capacity.

The report answers in the affirmative; but as to the application of the principle, it glides away into observations on that topic which are very general, but perhaps wiser ones, and more in harmony with French legislation than those which were put forward at a later time. This report supposed the Ecole d'Architecture, with an altered system of education, to be made a special college, like those of the physicians and the surgeons *in England and in France*: but making it the duty of the Ecole to give instruction, as well as to see that it was acquired; to examine the candidates, as well as to deliver the diploma; *it also insisted that even a formal attendance in the Ecole should be required of each candidate who had not been educated therein.* . . . . *In* 1843, *the Société was chartered.* . . . . In 1844, the Société Académique of Lyons requested the opinion of the Société Centrale as to a statement prepared for presentation to the Minister of the Interior upon the faults which existed in the organization of the profession of architecture, and on the necessary remedies. . . . .

The subject was referred to a Committee, and in March and June 1845, *Messrs. Blouet, Caristie,* *Debret, Gilbert, Sen., Gourlier, Jay, Lebas, Ch. Rohaut, and Leon Vaudoyer, reported* unanimously in favour of the establishment of a diploma; and by a majority, that it should be imperatively required from all architects; and they also pointed out the composition of the Board of Examiners; the cases in which the diploma should be granted without examination; &c. The Council of the Société took that report into consideration, and in June 1845, drew up a new and excellent work, entitled "Results of the Deliberations of the Council," which was distributed to the members previously to the first meeting held on the 17th June. Both in the Committee and in the Council, there were some objections to the principle of the creation of a diploma: these objections were founded upon reasons that really did not want weight: a diploma seemed to compromise the freedom of art. Another ground was the difficulty in appreciating artistic acquirements; and fears were expressed lest, in consequence of that very difficulty, scientific acquirements should obtain an invidious preponderance in the examinations. This reasoning failed.

I must here point out that the reason why success did not ultimately attend the efforts of the Société towards the establishment of a diploma, was connected with the second determination to which the Committee gave utteranee, viz., that it "should be imperatively required from all architects;" a view which was finally adopted by the Société, and which therefore required the assistance of the Government.

Upon the question of the imperative or voluntary character of the diploma, some persons alleged in favour of the more rigorous view, that not to require the diploma from every man before he was allowed to practise, was to fail in the object proposed: that such a step would allow the public to confound ignorant practitioners who usurped the title of architect, with approved artists who merited the rank: . . . . and that besides, if the diploma only authorized the possessor to adopt the title, it was not indispensable to any one in actual practice.

Others replied in favour of the voluntary system, that the profession of architecture, both as an art and as a science, had always been, and ought always to be, open to every one; that it was puerile to make the title essential, if the functions might be discharged by anybody; that in asking too much, there was the risk of obtaining nothing; and finally, that it would be sufficient to stipulate that the architects in the Civil Service must be possessed of a diploma. This reasoning prevailed, and the Council, differing with its Committee, adopted the idea of a voluntary examination; . . . . . *and also negatived suggestions for the creation of a secondary diploma for assistants and clerks of the works; as well for fixing an age which must have been attained by the candidates.* The Council, however, adopted the suggestions of its Committee as to the nature and amount of knowledge to be required; as to the composition of the Board of Examiners; and as to the classes of exemptions. . . . . *It also called attention to the reforms that were desirable in the system of education conducted under the auspices of the Academy, in the section of architecture at the Ecole des Beaux Arts; and noticed the necessity of improvement in the position of the Government architects.* . . . . *The memoir of the Council concluded by adopting as a standard of merit the knowledge to be acquired by earnest study during a whole year in the first class of the* Ecole des Beaux Arts. . . . . .

These results of the deliberations of the Council, communicated, as we have said, to the Société at its meeting on the 17th June, 1845, were remitted to Sub-Committees, one of which carried a proposal that before a general discussion the results should be submitted to a fresh Committee chosen by the Société: the new Committee consisted of Messrs. de Joly, Armand, Chatillon, Chargrasse, Girard, Nourrigat, Quicherat, Vigoureux, Sen. and Gounod, and it finished on 25th February, 1846, its labours, which were laid before the members at their own homes. The new report was perhaps less methodical than that of the Council, but very detailed, and full of interesting and carefully studied facts, which rendered it well worthy of the attention which it received. . . . . It asks, after some preliminary remarks, if the very existence of the Société Centrale did not render the creation of the diploma useless, and if the Société did not sufficiently distinguish, by its elections, the architects who really deserved the title. The report had no difficulty in giving an answer in the negative; and we are surprised that such questions were even put. Whatever opinions may be expressed upon the subject of the diploma, it is impossible to confound the public and official character which, if given by authority, the diploma would confer upon its bearer, with the truly honorable notice and the favorable inferences which a society like the Société Centrale, (*or this Institute,*) unshackled but possessing no official authority, can convey in the elections of its members. The new Committee did not separate the character of the proposed diploma from the relation that it might have with the Body, which ought (*in the opinion of the French architects as well as in my own*) to be completely distinct from it; as distinct for example, to continue our comparisons with analogous professions, as *the Church from the Universities; the Geological Society from the School of Practical Geology.* . . . . *There were other difficulties into which we need not examine, as they were chiefly connected with the Ecole des Beaux Arts.* The Report of the new Committee contained the following recommendations, viz. the creation of the diploma as a matter of necessity; its obligatory character; no dispensation from examination in any case; transitory measures in favour of positions already acquired; the age of thirty years (which is that absolutely of admission to the Société Centrale, 28 generally in the class of Fellows, to this Institute) and the delivery of the diploma by the offices of a Cabinet Minister. . . .

It will be seen that as the matter progressed, the regulations became more severe. . . . *Like the Council, the Committee* refused, as we think with great wisdom, to enter into any discussion upon details; such discussion would be fruitless, while principles are not decided. . . . . Before taking it to the general meeting, the report of the new Committee was discussed afresh by the Council, and this revision gave rise to a remarkable vote, which preceding votes would not have led us to expect, and which, it might be easily foreseen, would not be approved by the Body. The Council turned round; abandoned its first opinion, and negatived the principle of a diploma. . . . . The discussion of the last report took place at the general meeting of the 11th June, 1846; it was continued on the 24th June and 1st July. The Société did not consider itself prepared to discuss the questions relative to the formation of a Board of Examiners, and to the system of education; these were referred back to the Council; and it was not until the 28th October, 1846, that the Société was called upon to decide on these points as treated in a final report of the Council. It then

Resolved,—

That a diploma or certificate of capacity should be instituted, which should be indispensable in future before any person could legally take the title of architect, and practise as such either for individuals, or for Government, in any part of the country.

That the diploma should be delivered immediately and without examination to all architects actually engaged, and practising honourably; so that existing interests and already acquired positions should be respected.

That a programme should be adopted of the theoretical and practical acquirements which should in future be required, without any exception, for the delivery of the diploma after examinations and competitions.

That a Board of Examiners should be appointed, consisting of Architects.

That the Ecole des Beaux Arts should be remodelled.

That the Civil Service should be so far reorganized as to assure better treatment to architects who entered into the service of the public. . . . .

Here ended what may be called the deliberative phase of the subject: it lasted for six years:

the Société had arranged and decided upon its intentions, and had only to push them to realisation. . . . .

It is only necessary to add that the Société circulated in influential quarters an essay on its wishes, accompanied by the programme; that in 1847, the Société learnt that the previous Minister of Public Works had spoken favorably of the Société, that the acting Minister had promised his attention to the matter, and that a decree was all but signed when the events of February occurred. . . . .

The Council, however, applied to the Provisional Government, and reported an interview to the Société on the 6th March, 1848; whereupon another Committee was appointed to produce a new edition of the Essay just mentioned. Messrs. Henri Labrouste, Brunet-Debaines (replaced by Haron-Romain), Constant-Dufeux, Gounod, Jay, Adolphe Lance, Lepreux, Lucas, Tougard, and Gourlier, accordingly commenced operations, but the report submitted 10th November, 1848, contained only four articles; viz. the alteration of the Ecole; the institution of an imperative diploma; its delivery to practising architects; and the reform of the public service. . . . . *It would be painful to enter into a statement of the new discussions which arose in the Council, and at the meetings of the Société on 23d and 30th November, and on 7th December, 1848, which resulted in the adoption of the new Essay, with the exception of the passages as to the public service, and the Ecole; a vote which appears to have put an end for the present to the whole matter.*

The lesson, which this history, as given by M. Lance, is calculated to afford to ourselves, is one of the highest importance. The Société Centrale des Architectes, having become very exacting in its requirements, was not content to put its own shoulders to the wheel, and look after the interests of the profession, as a profession, so far as its constitution allowed it; but, perhaps involuntarily, perhaps obliged by the peculiar institutions and customs of France, it was led to interfere with the Academie des Beaux Arts and its School, to invoke the aid of the Government, and to enter into arrangements between the Public Service and its architectural officers.

There can be no wonder that having such different objects combined in one project, the Société has not yet gathered any fruit from its exertions.

The questions which arose naturally out of the subject, and which we have seen successively discussed by the Council and by the Society, were the following: we give them now, collectively, *so as to concentrate attention.*

1. Is a diploma for architecture necessary?
2. Shall the diploma be the result of a voluntary or of an imperative examination?
3. What body shall test the fitness of candidates?
4. What body shall give the diploma?
5. Is it desirable to fix any limit of age in candidates?
6. Shall the examination be open to all candidates?
7. Shall any candidates be exempt from examination?
8. What measures shall be taken to facilitate the adoption of the diploma?
9. What acquirements shall be tested in the examinations?

Does any one suppose that the diploma would take away from the profession of architecture its liberal character, and from the artist himself any portion of his independence? Can the medical man in that respect envy the architect? We think not. But it may be said that architecture should not be compared to medicine, but to its sister arts, painting and sculpture. We think otherwise. Architecture truly is one of the imaginative arts, but it is at the same time a positive science. The inspirations of a happy genius are not enough for it; it requires an amount of knowledge which the imagination cannot give. In practice the architect cannot be compared to the artist, who only requires a canvass or a block of marble to show all that he can do; the architect in some respects is more than that; he is an officer in command of a regiment that does not know the precise result intended by its manœuvres; he is an agent who disposes, it may be said, arbitrarily of the fortune of his client; he is almost a magistrate compelled to decide upon separate and generally conflicting interests, often of very considerable importance.

Whatever may be said or done, the man, whether he be an artist or not, who is likely to be invested with so much power, and whose position obliges him to accept such responsibility, cannot pretend legitimately to the independent freedom of artists in other walks, who execute their works with their own hands and at their own risk, without having to give any account of their management. This is so true, that while the painter and the sculptor can give with impunity proofs of their unfitness, the law has a hold, and a tolerably firm one, upon the careless or unskilful, or unfortunate architect. . . . .

We say that a diploma would have the advantage of adding to the consideration which the profession of architecture more or less enjoys; and indeed it is easily conceivable that in making a preliminary demand upon those who wish to exercise that profession for proof of some amount of acquired knowledge, the presumption of capacity resulting therefrom would place the body of diplomatized architects in a new position. . . . . Without doubt this diploma will not make a *William of Wykeham* nor a *Christopher Wren*, any more than a call to the Bar makes a *Cicero* or a *Burke;* but as it would represent a minimum of the knowledge indispensable to the public, it would be at one and the same time a recommendation to its possessor, and a guarantee to the public.

We would say further to the advocates for absolute liberty in the exercise of the profession of architecture,—suppose for a moment that medicine was to become free from all obligation of this sort; that is to say, accessible, as heretofore, to horse-doctors, to farriers, to vendors of nostrums, to barber-surgeons, to all such adventurers, and to any one else who had no other skill than that of boldness and quackery—suppose that; and imagine the condition of suffering humanity under the scourge of such disguised assassins; disputing greedily for the bed's-head of the patient, purging here, bleeding there, amputating one extremity, trephining another; in short, having the right to kill anybody under authority of a licence granted for two pounds per annum.

Yet this is very nearly the situation in which we are placed by the liberty which we enjoy: "*an abandonment to destruction rather, in which we are left to perish.*" There is this difference, it is true; the parasites of architecture are less dangerous than those just mentioned, because they attack the purse more than the body of our fellow-citizens; but society owes protection equally to the property as to the person. . . . .

And, moreover, whatever may be said, the public ought not to be left to assure itself beforehand as to the capacity of architects; the public cannot possibly be a good judge of merits which it cannot itself test. We may even say that the public should in such cases be treated as a minor, and that some authority, some guardian, should exist, not to hinder it from speculating foolishly if it likes, but to give it the means of saving property if it chooses. . . . .

We have spoken also of the Law; and indeed there is a relation between that profession and architecture which it is impossible to overlook, because, like the lawyers, we are employed to defend the interests of others. Still there is this difference between an advocate and an architect; the first, properly speaking, is only a counsellor, who in disputes between parties has only a deliberative voice, while the architect's is administrative. In other words, the advocate may plead more or less forcibly the cause of his client, may even be so unfortunate as to compromise the success which he seeks, but sees above him competent and enlightened judges seated to perform justice, and to give a chance that the truth may appear in spite of the ignorance or carelessness of the lawyer, who may risk the interests of his client, but cannot always sacrifice them. Our part in business has a very different importance. The architect is not merely the advocate charged to enlighten a tribunal which has to pronounce judgment; he is more, for he is a judge, who can take no opinion but his own, *and whose decisions are not open to public inspection:* now if this judge be unskilful or dishonest, we guess, and it may be boldly said, we know the abuses and dirty actions which may result from this uncontrollable power, if it is exercised without conscience and without talent. Nevertheless, incredible as it may seem, the law requires that the mere advocate shall have given proof of capacity and experience, while it demands nothing, absolutely nothing, of that arbitrator, referee, umpire, who, under cover of that quality, can commit the grossest errors, nay, even crimes, at the expense of the parties who have honoured him with their confidence.

There is evidently a gross anomaly here which it is of the highest importance to ourselves to remove: *the establishment of the Institute, and its severity in carrying out its law of expulsion, are guarantee to the public of the unimpeachable honesty of its members; but where is the guarantee of their possessing that amount of skill which only can elevate the architect above the self-assumption of uneducated persons.*

The remainder of M. Lance's essay relates to the position of affairs in France so much, as to render it less interesting than I feel certain the preceding portion has proved.

This is, perhaps, the proper occasion for submitting my own views as to the practical solution of the question in England.

The necessity for a diploma is apparent from the fact that the junior branches of the profession have for many years been seeking it, as being desirable for themselves and perfectly innocuous to the elder architects. Professor Cockerell will of course support with alacrity any matured plan for securing better public appreciation of the art and its professors. Professor Donaldson has announced in this room, as a matter for self-gratulation to us, the establishment of certificates in two colleges. Sir Robert Smirke, Sir Charles Barry, and Mr. Hardwick, cannot be supposed indifferent to the wishes of their professional brethren. Mr. Sydney Smirke and Mr. Gilbert Scott equally are anxious for the improvement of our position. Mr. Tite you have already heard; and in fact the only opposition which the measure of establishing a diploma can encounter would arise from those who feel some hesitation as to the possibility of their deserving it.

The diploma cannot be the result of an imperative examination, without an Act of Parliament to that effect; and the Legislature will of course refuse such an Act until the profession has shown that the diploma is feasible and in operation. The Institute should never require the diploma of any candidate for election into its own body. The examination would be most honourable as a voluntary one.

The examining body should at first be composed of those who occupy a high station with the profession and with the public,—hereafter those who take the highest honors would replace them as occasion should demand.

The question of the body which should grant the diploma is a difficulty in the eyes of some. There have been three competing opinions as to the preference to be given to the Universities, the Examiners, or the Institute. The Universities might follow our example if they found it well so to do; the Examiners would be subordinate to ourselves; and therefore the Institute, especially if it should obtain an amended charter, seems to be the body which, as professional men, we should prefer.

It is hardly less desirable to fix any limit of age to candidates, than to close the examination-room *against any candidate, whatever may be his position in society; if he be found fit to practise as an architect, that qualification should entitle him to the diploma.*

The exemption of any candidate from examination would be a fatal error; nor should any candidate be allowed to pass upon a lower standard than that fixed for all comers.

To facilitate the adoption of the diploma, I imagine the adoption of a chairman, who should be, if possible, a President of this body. I imagine that the three Professors would not refuse to accept the diploma at his hands; and then we have a Board who could give to all qualified persons, who have practised legitimately during the last few years as architects, the diploma of Master in Architecture, and to those who have been so engaged for a short time only, the diploma of Bachelor. I suppose that some would be found to deserve the most honourable degree of Doctor in Architecture.

It must be evident that the severity of examination for these degrees must be relaxed for the first three years; there are men of established repute whose neglect of the diploma might be hurtful at first to its existence, and who might not choose to do more than present themselves personally to claim it; and this class must be consulted in order to facilitate the transition.

Then, when the examinations are fixed, the Board would only have in the first year to verify the position held by the candidate, and his power of making before them a tinted sketch and an outline of detail, in order to hand to him their certificate of the ordinary degree of Master or Bachelor, as the case may be. While if the candidate apply for a higher degree than that which he would ordinarily claim, we should all rejoice at his being found worthy of it.

At the end of three years the examinations should be stricter, and at the end of five years they should have attained the ultimatum, for a time, of their severity; then the profession would be in such a position as it cannot at present hold; and might reasonably hope to procure the adoption by the Legislature of a Bill against quack-architects.

I shall conclude by observing that I sincerely hope the examinations will be public, i.e. will be held in the presence of any graduates who choose to attend them; and that the examiners will avoid the fault of the Continental systems, and not ask questions upon formulæ and facts to test the memory of a candidate crammed for the occasion, and ready to forget all on the next day,—but put such questions as a candidate may be expected to answer, by referring to works in the library of the Institute. It is not what a man can recollect, but his knowledge of how to use and where to find information, which is the great secret of the skill of the architect as a scientific man, and of his knowledge as an archæologist. His taste cannot even be a question for the examiners; but readiness with the chalk, the brush and the pencil are, I venture to presume, indispensable to the man who lays claim to the authorised title, the honourable title, of architect.

A DISCUSSION AT THE ROYAL INSTITUTE OF BRITISH ARCHITECTS,

November 19, 1855,

On Subjects connected with the Address delivered at the Opening Meeting, by Mr. Tite, V.P.

Mr. J. W. Papworth, Fellow, having read an abridged translation of M. Lance's Essay "On a Diploma in Architecture," with remarks and suggestions,

Mr. H. H. Burnell, Associate, proceeded to lay before the meeting the results of his own experience during his studies in Paris, and the following scheme of instruction and examination to which competitors for the architectural prizes are subjected in that metropolis.

Examination of Candidates for admission as Students of Architecture at the Ecole Imperiale des Beaux-Arts, Paris.

Before a candidate can present himself for examination he must become the pupil of some known architect, cause his name to be inscribed in the book of the Ecole des Beaux-Arts, and present the certificate of his birth (acte de naissance) in order to prove his age. A student is generally from one to two years in the "atelier" of his professor before presenting himself for examination.

1st Examination—Arithmetic; Geometry; Algebra. (*Verbal Examination.*)

2nd Examination—Descriptive Geometry. (*Verbal Examination*); and a difficult Geometrical Exercise, called "Une Epure;" to be done in twelve hours.

3rd Examination—A Sketch* of a Building, consisting of Plan, Elevation, and Section, from a given Particular; to be done in twelve hours.

Should the Student succeed in passing the three Examinations, he is admitted as a Student of the 2nd Class, and may take part in the following competitions, which are thus divided:—

Mathematics—

Statics; Conic Sections, &c.; Land Surveying; Mensuration. (*Verbal Examination.*)

Trigonometry; Resolution of the Triangle, &c. (*Examination by Papers.*)

These examinations take place every year. The rewards are medals and certificates of merit. The student must gain a medal and a certificate of merit to be admitted to the 1st Class.

Perspective—

An exercise to be done in twelve hours, from a given particular.

This competition takes place once a year. The rewards are medals and certificates of merit. The student must gain at least a certificate of merit to enter the 1st Class.

Construction—

In Stone; in Wood (comprising Roofs, Girders, &c.); in Iron; General Construction.

Three months are allowed for each of these competitions. Students are required to make the sketch from a given particular in twelve hours, and the finished drawings in three months. The rewards are medals and certificates of merit. A medal must be gained in each competition to enter the 1st Class.

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* All Sketches are made "en Loge" within the walls of the "Ecole des Beaux-Arts;" the Finished Drawings (except for the "Grand Prix") are made under the superintendence, and in the Atelier of the Student's Professor. The Exhibitions of Sketches and Finished Drawings are open to the Public.

Architecture—

Every two months a competition takes place. A sketch is required to be made in twelve hours (according to a given programme), and the finished drawings in two months. There is also a competition every two months for sketches; they are made in twelve hours, according to a given particular. The rewards are certificates of merit, of which the student must gain three to be admitted to the 1st Class.

When the before-named competitions and examinations have been passed, and the required number of medals and certificates gained, the Student is declared to be of the 1st Class, and may take part in the following proceedings till he attains the age of thirty years.

FIRST CLASS.

A competition takes place every two months. The sketch is made in twelve hours, and the finished drawings in two months, from a given particular.

There is also a competition for sketches (*only*) every two months; they are made in twelve hours, according to given particulars.

The rewards are medals, which are distributed every year at the General Meeting at the Ecole des Beaux-Arts, but the judgment is given immediately after each exhibition.

The jury that adjudge these various premiums elect their own members, but the members of the Institute have the right to form part.

GRAND PRIX (OR FIRST PRIZE.)

The competition for this prize is given and judged by the members of the Institute only.

The 1*st Trial* (with a view to compete) is a sketch in twelve hours. The students of the 1st, as also those of the 2nd Class, who have obtained medals in Mathematics, Perspective, and Construction, have a right to take part. The students who have gained a medal in the 1st Class are exempt from this competition, and have a right to join the 2*nd Trial.* Fifty students are received.

2*nd Trial.*—These fifty students compete in sketches made from a given particular in twenty-four hours, and of the fifty only *eight* are received.

3*rd Trial.*—The eight students have then to prepare a sketch (as before) according to a given particular, for which ten days and ten nights are allowed, during which time they are placed in separate rooms, under strict surveillance, and are not allowed on any account to leave the premises; after which, four months are allowed to make the finished drawings in the said rooms of the academy. The judgment is given by the members of the Institute, who are architects, which judgment is afterwards ratified by the rest.

The Chairman (Mr. TITE,) V.P., stated that on the present occasion the Council were desirous rather to collect information than to proceed to the immediate discussion of the principle involved in an architectural examination and diploma, as brought before them by Mr. Papworth's paper just read. The remarks which he (Mr. Tite) had made at the last meeting had not yet been distributed amongst the members,—a domestic calamity deprived them of the presence of the Hon. Sec. for Foreign Correspondence, who had paid great attention to the subject,—the unfavourable weather had kept many other members away—and under all these circumstances it would be better to postpone the further consideration of the subject. He had himself given to the members the Prussian system of examination; Mr. Burnell had just laid before them that of France; and the Spanish system had also been referred to in the able translation read by Mr. Papworth. Probably some gentleman present might be able to explain, from his own observation, the practical working of the German system; and if so, that, or any similar information, would be most acceptable.

Mr. G. R. Burnell, C.E., Visitor, stated that, from what he had seen of modern architecture in Spain, he was not disposed to think the system there pursued had succeeded; no works of excellence whatever having been produced. He had been endeavouring to obtain some information as to the Spanish examination, and if the discussion were adjourned,—in the propriety of which he entirely concurred,—he hoped to submit the same at the next meeting. He would, however, take the present opportunity of adverting to the comparison of French and English architecture instituted by the Chairman at the meeting on the 5th instant,—a comparison fraught with instruction to English architects, if read aright. In spite of the wonderful ability of the French architects, and their manifest efforts to arrive at something good and true, he believed that they had made a great mistake in the course they had adopted. They appeared to consider it a duty to break through all kind of architectural traditions,—whether classical or mediæval,—and to despise and renounce them altogether. They were striving to invent a style of their own, and one which they intended to be in accordance with the wants of the present day, and of the people around them. In this commendable effort they might eventually to some extent succeed; but at the present time he thought if any person wished to select a bad school of architecture, he could not do better than to study the modern works of France. The street architecture of Paris (well described to him by Mr. Papworth as the "bed-post and valence" style,) presented an extraordinary system of balancing supports and openings, and the introduction of small panels with very slight projections. He had measured a great many of these panels and pilasters, and found that the projections in many cases barely exceeded two-fifths of an inch! The mouldings were badly profiled, had no expression, and gave no shadow; indeed all the lessons of experience, and the optical knowledge of the architects of former days, appeared to have been cast aside. A low relief had been adopted in the ornamentation, something similar to the fret-work which Sir John Soane had introduced some years ago; and upon the whole he thought he could perceive an analogy between the modern architecture of France and that which prevailed in Rome at the decline of the Roman Empire. He suspected there was a greater analogy between the moral and political condition of a country, and the state of its Fine Arts, than was generally supposed; and if they were to examine such matters philosophically, instead of giving themselves up to the guidance of men who dazzled them with Lamps of Architecture, and attempted to crush them with wonderful "Stones" from Venice, they would do much better than they had done at present. The French people had no national character at present,—neither had their architecture. The abattoirs and other *practical* public buildings of the time of Napoleon I. had far more architectural expression and feeling than the new works of the Louvre and other recent structures. The architecture of the period of Louis XVIII. was as superior to that of the present time as the state of political freedom then was to what it is now. If the Bourse and the Chamber of Deputies were compared with the buildings erected of late years it would be evident that in architecture France had fallen from its high estate. The Chairman had regretted the excessive cultivation of mediæval art. He (Mr. G. Burnell) considered the exclusive study either of classical or mediæval art as a defect. Wren, Jones, and the other masters of modern architecture practised before the date of the books cited by the Chairman as the models from which the young architect could best study. Palladio, Scamozzi, and Vignola, reasoned for themselves, and modified the antique without studying it blindly; and this was the course which ought always to be adopted. The Chairman had also said that Sir Charles Barry had succeeded in infusing the spirit of Gothic architecture into the New Houses of Parliament; but it should be remembered that the mediæval architects paid due attention to general principles, and never repeated a style which had become obsolete; the style of the twelfth century was never repeated in the thirteenth; but now, in the nineteenth century, we were servilely copying details well adapted to a long antecedent stage of art, but not to our present wants. In the Houses of Parliament the committee rooms were sacrificed to the passages; and in the British Museum the necessity for two stories internally with one external order, rendered both suites of rooms exceedingly inconvenient, low, and badly lighted. It was not by copying either classical, mediæval or cinque cento forms that any good could be done. At the same time, while the French architects were, as he believed, mistaken in the course they had pursued, he believed they were upon a truer path, and more likely to arrive eventually at something which would advance and elevate the art than their brethren in England.

Mr. H. H. Burnell observed, with regard to the ornamentation in low relief which had been adopted in Paris, it should be borne in mind that the streets there were narrow; the ground was dear, and a higher degree of relief would have involved great expense in the stone façades of that city. The houses were frequently erected before the design for the decoration was prepared, and, considering the width of the streets he doubted whether a greater projection in the ornamentation would be an improvement. Certainly, no architect employed in Paris to carry out the views and study the interest of his employer would erect a projecting cornice in Paris such as was commonly seen in London.

The Chairman, referring to his opening address, was desirous to make a few further remarks with reference to the exclusive attention to Gothic architecture. He very much regretted to see that style applied to buildings for which Classical Architecture was much more fitted; such, for example, as town halls and markets. Even for some churches, and for chapels especially, the architecture which was learnt in Italy, was much better adapted than that now in fashion, There was hardly a competition of any kind, but it must be in the style of Edward III, or something similar. In his own neighbourhood, he could not help noticing daily, in passing, two modern Gothic churches, without any fitness or congruity with reference to the elegant houses surrounding them. One of these was not accurate even as an imitation;—the other was very elegant indeed, but he could not conceive why a church of that sort,—excellently adapted for the situation in which our forefathers would have placed it,—namely, in the country, amongst trees, rural scenery, and low and moderate sized houses,—should be placed at the end of a modern square in London, with houses 70 or 80 feet high around it. The character and fitness of such buildings was too much neglected. With regard to the small amount of projection in French street architecture, he considered the fact would rather lead to the view that the Parisian architects were leaning to the wants of the place and the times;—and in like manner, in the enormous warehouses recently erected in London and Manchester, the necessities of the trade carried on within them,—such as obtaining large accommodation and a great many stories in height upon a limited site,—had led to an appropriateness of character and style which was highly creditable. Architects were not sufficiently independent in their modes of thinking. Their education was a short one, and was rather adapted to provide that which was agreeable than that which was necessary. It was too much the fashion to adhere to one style only at a time. The Greek mania of some years ago was as great a mistake as the Gothic mania of the present day; and it was necessary to understand that one style was fitted to one class of buildings, and another style to a different class, and that the study of both might be entertained. He had been much struck with the misapplication of Gothic architecture to modern purposes in visiting a very elegant church in Yorkshire, on the outskirts of a manufacturing town, in company with the agent of the gentleman who built it. After examining it the clergyman, who was also present, said that every thing in the church was excellent, except its fitness for the purpose for which it was built: The congregation could not hear, or sit with any comfort; there was no ventilation, and the warming was defective; the clergyman complained of the reading desk, and the pulpit being made of stone was so cold that he could not put his hand upon it; indeed the church altogether was so inconvenient that the people would rather stay away than go to it. Yet this church was a most accurate and elegant imitation of the style of Edward III, wanting nothing but the rood loft and the priest, and the substitution of chairs as in Roman Catholic churches for the fixed seats : it displayed an utter want of fitness and of all thought, except as applied to the mere identical copying, with great skill and beauty, of a mediæval work,—with far greater beauty indeed than the architects and masons of Edward III.'s time could have shewn. Fortunately, in the city of London they were wiser, or such a warehouse as that of Messrs. Cook & Sons would have been twisted into some imitation of the Gothic style. Palladio and the great English architects of the 17th century thought for themselves ; and although they based their designs upon the great types of Roman Architecture, they modified and adapted them to the requisite purposes. He was most anxious to impress upon all who heard him, and especially on the younger members of the profession, that, as Lord Bacon said, houses were built to live in and not to look at, and that churches were built to worship in, and to be adapted to a state of things which some of them, it was possible, might live to see altered ; but which, whilst they did exist, must be provided for. The neglect of this necessity was strikingly displayed in the church he had already referred to, where the altar and communion arrangements were of the most inconvenient description, whilst on the south side of the altar were three sedilia, forming admirable seats, though there was no one to sit in them. In this, which was a large parish church, only twelve persons at a time could kneel to receive the sacrament, whereas there should have been accommodation proportionate to the wants of two or three hundred communicants on any given Sunday ; a most enormous mistake, without reference to Tractarianism or any other *ism ;* and a striking instance of the error of merely copying, without thinking of the purpose to which the copy was to be applied. In the Roman Catholic religion all the forms of Gothic architecture went right, but as applied to the Protestant ritual everything went wrong, and the buildings, although exquisite in themselves, were neither suited to their purpose, nor to the places which they too often occupied. These were his sincere opinions, although no doubt they would be considered very heterodox, rather than orthodox.

Mr. HESKETH, Fellow, inquired what kind of examination the Architectural Association contemplated, and whether it was to include mathematics, and any branches of physics.

Mr. PAPWORTH said, that he could remember the question of an architectural examination being under discussion for the last 16 or 17 years, and the difficulty had always been to know whether the junior members of the profession would come forward and adopt it. The Architectural Association had nobly answered that question, and effectually removed the doubt. With regard to the kind of examination, he did not feel called upon to add anything to what he had already said ; except that they could hardly do better than follow the system adopted in the Civil Service. Those gentlemen drew up the questions for themselves, and in the majority of cases the examinations had met with the approval both of candidates and critics. He believed Mr. George Burnell's memory had rather failed him in one point, as the Bourse and other Parisian buildings possessing the manly character which was now deficient, were erected under the despotism of Napoleon I. Differing from Mr. Burnell, he believed that the arts had often flourished more under a despotism than a republic, the times of Pericles, the Medici, the Popes, and Louis XIV, might be cited in support of this view. With regard to the question of copying, it was true that English architects copied the details of former styles most admirably, but both in classical and mediæval restorations it was too common to see a window copied from a first class building applied in connection with a door from an inferior one ; or the door of a parish church, with the east window of a cathedral.

Mr. FOWLER, Fellow, with regard to the same question of copying, observed that whilst great merit was due to those gentlemen who had so zealously applied themselves to promote the societies formed in different parts of the kingdom for the study of archæology, and although great benefit had accrued from those societies, yet, at the same time, they had been very instrumental in establishing the practice of imitation. The majority of the leading members of such societies were clergymen, who had displayed excessive zeal, spirit, and activity in bringing to light remains which had been lost, and in getting them restored and imitated; and their strong predilection for the works of our ancestors rendered them insensible to the merits of any other style of art. Even the utmost fidelity of imitation, although desirable in works of restoration, was not desirable in rebuilding. He agreed with the Chairman in thinking that the very close imitation of mediæval architecture often placed modern architects in a very absurd position. The architect should be always guided by reason and taste; but in copying so minutely former styles, the architect abandoned his reason altogether. As an illustration of the extent to which people were led by adherence to precedent and a disregard of fitness, he might mention that when he was erecting Covent Garden Market he determined that the building should be one of utility, without affecting any pretence to useless ornament;—but during the progress of the work he was called upon by the Duke of Bedford to explain the omission of the triglyphs from an adaptation of the Doric frieze. This was only one of many instances which had occurred to shew that an architect was too often supposed to have no discretion of his own, but was bound to have authority for every thing he did. With regard to street architecture, he thought the style which had been imported from Italy was striking and effective, and was a great step in advance on former styles; but the characteristics of that style were sometimes carried out in unsuitable positions. Thus, in rebuilding a house which had fallen down in Wood Street, the very handsome front of the new building was surmounted by a cornice projecting more than four feet, the street being about sixteen feet wide. If, therefore, the houses on the opposite sides were to be rebuilt with a similar cornice, the sky seen from the street would be reduced one half. Probably the Legislature had never contemplated the possibility of any thing so absurd, and therefore there was no law to prevent it; but he considered it a grievance which ought to be restrained as an offence against propriety and common sense. He hoped the time would come when reason would be followed, and servile imitation would be deprecated.

Mr. George Burnell, C.E., referred to the drawings in the room of the Tower of Antwerp Cathedral, which he observed was erected in [1588]; about the same period as St. Peters, at Rome; a sufficient proof that the architects of that age did not copy from one another.

Mr. Cates, Visitor, stated that the Architectural Association had unanimously agreed to a memorial on the subject of the diploma, which would be laid before the Institute.

Mr. Papworth moved the thanks of the meeting to M. Lance for his kindness in laying his paper before them, and the Chairman added the thanks of the Meeting to Mr. Papworth for his able translation and comments. The vote being unanimously agreed to,

The meeting then adjourned, with the understanding that the discussion on the diploma, as called forth by Mr. Papworth's paper, would take place at the next meeting on the 3rd of December.

DISCUSSION ON A DIPLOMA IN ARCHITECTURE,

Held at the Ordinary General Meeting of the Royal Institute of British Architects, December 3rd, 1855.

The Chairman, Mr. Tite, V. P., adverted to the suggestion which had proceeded from the Architectural Association in favour of a professional examination and diploma, and stated that the Council of the Institute had now received a memorial from the Association to the same effect; and although that document could not be discussed as a matter of detail, yet the question of principle,—whether the Council could constitute such a body of examiners as might increase the confidence of the public and the value of the profession,—was now before the meeting. Since the last meeting he had received from Mr. Arthur Cates the syllabus of the course of examination to which the members of the Institute of Actuaries had voluntarily agreed to subject themselves. The list of scientific pursuits in which a system of examination was adopted had thus been completed—with the exception of architecture and engineering,—for it appeared that, under the sanction of the authorities of Lincoln's Inn, a severe system of examination had also been established for barristers, which it was expected would hereafter be legally enforced. Having already addressed the members at length on this subject, he invited the free and open discussion of it, and would suggest that, if any determination should be arrived at, it might be embodied in a resolution, affirming (or otherwise) the principle that an examination with a view to a diploma should originate with the Institute of British Architects.

At the suggestion of Mr. Papworth, Fellow, the following Memorial from the Architectural Association was read by the Hon. Secretary.

To the President and Council of the Royal Institute of British Architects.

The Memorial of the Architectural Association.

My Lord and Gentlemen,

Your memorialists, representing the younger members of the architectural profession, beg to lay before the Royal Institute of British Architects, their desire for the establishment of an examination, which should eventually serve as the basis for the issue of such a diploma as shall certify that the holder thereof is fully qualified to practise as an architect.

They have been induced to take this step, from the consideration of the difficulties which, in the present day, beset the early stages of architectural education.

In preparation for entrance upon their articles, in studies during the period of their sojourn in an office, and in the critical interval from the completion of their articles to the moment of commencing practice, the students of architecture are without sufficient guidance. In no case have they that important and valuable direction given to their several studies, which is found to be so successful an inducement to the complete mastery of other professions, and this evil produces its more important effects when students of architecture having completed their articles, commence practice on their own responsibility.

The want of proper knowledge on the part of the architect, combined as it is with a want of information on the part of the public, leads to many of the anomalies which are now so frequently observable in the practice of the profession, and to the presence in its ranks of many who have not the power, and in some cases, of those who have not the will, to uphold its credit.

So much attention has been lately turned towards the necessity of testing by examination the competency of all candidates for public employment, that your memorialists are led to submit that the present is a highly opportune period for bringing the subject under your consideration. They feel that they are addressing those who represent the architectural profession, and by whom only an authoritative step towards the establishment of an examination, or the granting of a diploma, could be taken. They are also assured, that the senior members of the profession, could hardly take the initiative till the necessity for that course had been brought before them by those who have more recently entered the profession.

Your memorialists do not feel themselves called upon to enter into further details, because they are convinced that the members of the Institute must, from their position, be fully cognizant of the evil results of the present system; and therefore do not doubt, that the Council will take an early opportunity of organizing an examination, such as shall be found best calculated to aid and direct the student, and to bring the real qualifications of the architect before the public.

ALFRED BAILEY, *President of the Architectural Association.*

Mr. PAPWORTH proceeded to read the following remarks:—

The advocates of the Memorial have urged only the principle of a diploma: for my own part, in order to treat the matter in its fullest bearings, I have assumed a plan and its leading details. The memorialists and myself are of one mind in this respect: we say that a diploma would have the advantage of adding to the consideration which the profession of architecture more or less enjoys; and indeed it is easily conceivable that a preliminary demand, upon those who wish to exercise that profession, for proof of some amount of acquired knowledge, would alone place the body of architects in a new position. . . . . Without doubt this diploma will not make a *William of Wykeham* nor a *Christopher Wren*, any more than a call to the Bar makes a *Cicero* or a *Burke;* but as it would represent a minimum of the knowledge indispensable to the public, it would be at one and the same time a recommendation to its possessor, and a guarantee to the public.

And, moreover, whatever may be said, the public ought not to be left to assure itself beforehand as to the capacity of architects: the public cannot possibly at present be a good judge of merits which it cannot itself test. We even say that the public should in such cases be treated as a minor, and that some authority, some guardian, should exist, not to hinder it from speculating foolishly if it likes, but to give it the means of saving property if it chooses. And this is felt by the Legislature, which establishes District Surveyorships, and by the Scottish examination, mentioned in the following letter:—

"The mode of application to be admitted as an ordained Surveyor is by petition to the Town Council, stating what branch of the profession the petitioner is desirous to be examined upon, and requesting that the Council would take him on trial with a view to his being ordained if found qualified. On receiving the petition the Council then generally remit to their Superintendent of Works, with one or more ordained Surveyors, whom they name to take the petitioner on trial, and to report to them on his qualifications, which being done, the petitioner is then requested to appear (if found qualified) on a certain day named, before one of the magistrates, when he is sworn to do justice, and has to find caution that he will do so. This latter part is a mere form; and, indeed, the whole proceedings have got to be a matter of form altogether. The examination is usually gone over in the course of two or three hours, and there are but few, if any, instances of an individual having been rejected. In my opinion, the ordaining of a Surveyor should be by the Architectural Institute, in Scotland, where there is no Institute of Engineers and Surveyors, and a prescribed course be given, on which the party should be examined."

If it is urged that the establishment of the Institute and its severity in carrying out its law of expulsion, are guarantees to the public of the unimpeachable honesty of its members, we answer that is not enough—that is not a guarantee of those members possessing the amount of skill which only can elevate the architect above the uneducated persons who arrogate his title. And it must be recollected that the Institute is not the profession: it is a club, so to speak, chiefly of London Architects; for it is a vain assumption to call ourselves the Institute of British Architects when similar societies in Dublin and Edinburgh, (not to mention those in Birmingham, Bristol, and Liverpool, and those anomalous associations, called Diocesan Architectural Societies,) have been formed and are forming, entirely independent of the Metropolitan Body, and therefore not following the example of Glasgow in relation to Edinburgh. As such a club, the Institute cannot do more than constitute a Board of Examiners, with the control and consideration which our possession of the principal Architects in England as a chartered Body under Royal patronage can give to a committee of ourselves.

There have been competing opinions as to the preference to be given to the Universities, the Examiners, a general Association, or the Institute. The Universities might follow our example if they found it well so to do; the examiners would be subordinate to ourselves; an association will never be formed, and therefore the Institute, especially if it should obtain an amended charter, seems to be the body which, as professional men, we should prefer.

If it is suggested as a question whether the Institute can act (in accordance with the views of the Memorialists) under the charter, I shall only mention the decision of the Institute as to establishing the classes of Honorary Members and of Honorary and Corresponding Members, which are not mentioned in the Charter although the corporate seal of the body is affixed to their brevets.

It was very gratifying that the last meeting received with satisfaction the idea that taste cannot even be a question for the examiners; but that readiness with the chalk, the brush, and the pencil, are indispensable to the man who lays claim to the title of architect.

That meeting seemed also to consider that the examiners should avoid the fault of the Continental systems, and not ask questions upon formulæ and facts to test the memory of a candidate crammed for the occasion, and ready to forget all on the next day,—but put such questions as a candidate may be expected to answer, by referring to works in the library of the Institute. It is not what a man can recollect, but his knowledge of how to use and where to find information, which is the great secret of the skill of the architect as a scientific man, and of his knowledge as an archæologist.

For my own part I sincerely hope the examinations will be public, *i. e.* will be held in the presence of any graduates who choose to attend them; the examining body should at first be composed of those who occupy a high station with the profession and with the public,—hereafter those who take the highest honors would replace them as occasion should demand.

To facilitate the adoption of the diploma, I imagine the adoption of a chairman, who should be, if possible, a President of this body. I imagine that the three Professors, Messrs. Cockerell, Donaldson and Hosking, would not refuse to accept the diploma at his hands; and then we have a Board who could give to all qualified persons, who have practised legitimately during the last few years as architects, the diploma of Master in Architecture, and to those who have been so engaged for a short time only, the diploma of Bachelor. I suppose that some would be found to deserve the most honorable degree of Doctor in Architecture.

At the end of three years the examinations should be stricter, and at the end of five years they should have attained the ultimatum, for a time, of their severity; then the profession would be in such a position as it cannot at present hold; and might reasonably hope to procure the adoption by the Legislature of a Bill against quack-architects.

It must be evident that the severity of examination for these degrees must be relaxed for the first three years: there are men of established repute whose neglect of the diploma might be hurtful at first to its existence, and who might not choose to do more than present themselves personally to claim it; and this class must be consulted in order to facilitate the transition.

Then, when the examinations are fixed, the Board would only have in the first year to verify the position held by the candidate, and his power of making before them a tinted sketch and an outline of detail, in order to hand to him their certificate of the ordinary degree of Master or Bachelor, as the case may be. While if the candidate apply for a higher degree than that which he would ordinarily claim, we should all rejoice at his being found worthy of it.

The exemption of any candidate from examination would be a fatal error; nor should any candidate be allowed to pass upon a lower standard than that fixed for all comers.

It is hardly less desirable to fix any limit of age to candidates, than to close the examination-room against any candidate, whatever may be his position in society; if he be found fit to practise as an architect, that qualification should entitle him to the diploma.

Hereafter, especially under an amended charter of the Institute, we may reasonably hope to entertain the establishment of lectures preparatory to the examination, which being open to the public, shall co-operate with the diploma in the attainment of our object as set forth in the charter, namely, the general advancement of civil architecture, and the promotion and facilitation of the acquirement of the knowledge of the various arts and sciences connected therewith; and in truth I look upon the diploma as only an expedient, for if we had a public sufficiently instructed to know what to demand of its architects, there would be no necessity for a diploma to guard the interests of that public, and district surveyors would not be expected to fulfil the duties of inspectors of public nuisances. The examination would be most honourable as a voluntary one.

The diploma cannot be the result of an imperative examination, without an Act of Parliament to that effect; and the Legislature will of course refuse such an Act until the profession has shown that the diploma is feasible and in operation. The Institute should never require the diploma of any candidate for election into its own body.

Professor Donaldson has announced in this room, as a matter of self-gratulation to us, the establishment of certificates in two colleges. And the Royal Institute of British Architects (I must use in this case the full name) having obtained at its own request the legal right of examining candidates for District Surveyorships, cannot with a good grace refuse to accede to the nobly disinterested application made in such well considered terms and at so well chosen a time by the Architectural Association, of which (and I am proud to say it on this occasion) the most active members are chiefly associates of this Institute.

Mr. Bailey, Associate, begged to offer a few remarks on the part of the Architectural Association. In reference to the kind of examination which they contemplated, the Association had been very careful not to presume to dictate to the Institute in any way. He might however observe, that the qualifications required in the Spanish system which had been submitted by Mr. Burnell, were of so low a standard, that it seemed impossible that the system should succeed. On the other hand, the qualifications required on the Prussian system were too high. The latter, however, was part of the academical system at Berlin. The Architectural Academy there was held in a public building, and the examination was based upon the subjects taught in that academy. Like all Germans, the Prussians were highly educated, but they certainly were not a practical nation. They possessed many highly qualified and scientific architects, but the public did not appreciate or place confidence in them. Thus, in Berlin, nobody was heard of but Schinkel, or in Munich, but Klenze; in the small towns there was merely the court architect and nobody else; a great number of highly qualified young German architects remaining in what might be termed a state of armed neutrality. In the Prussian scheme of examination there were many things not indispensable in an architect, although perhaps highly desirable; and it might be praticable to grant a diploma upon an examination on the indispensable points; the examination on the other desirable matters being only a question of honor. Mr. Hesketh had suggested mathematics, a subject too much neglected by young architects. No doubt, this subject should be included, but to what extent might be questionable. Algebra, and plane trigonometry, were of course indispensable, but it might be doubted whether the differential calculus was essential, and certainly it appeared absurd, that a man should not pass his examination as an architect, without being acquainted with short-hand! It had been urged, that too stringent an examination would deter many candidates, but on the part of the young men who had suggested it, he could assure the meeting, that they felt that, to be of any use to them, the examination must be severe; such indeed, that it should be no disgrace to a man to go up and get "plucked" even two or three times. He would thus discover his deficiencies, and be enabled to study further any subject which he might have previously neglected. The question of honours was rather a matter of detail, but if high honours could be taken, it would be of great use to the young men. Mr. Papworth had said, that the fact of passing an examination ought not to constitute a qualification as a member of the Institute, but on that point he differed with Mr. Papworth. At present, no previous examination as to ability being necessary, but merely respectability, the personal acquaintance of three architects, fellows, and sufficient wealth to be able to pay the annual subscription, no honour was attached to the fact of being an associate. Mr. Papworth had further observed, that the question of taste must be left out of the examination, and here also he differed with that gentleman. He knew more than one London builder who could pass an examination with great credit, if nothing more was required than the capability of making an outline detailed sketch, and a certain facility with the brush and the pencil, although they might be totally unable to make a creditable design. The examination should not be one of facts and formulæ, and if a design were submitted, the examiners would easily be able to see whether the candidate had gone through a sufficient course of study. It had been objected, that certain examiners would be prejudiced in favor of particular styles (the bugbear of "styles" being raised on all occasions); but he did not believe this would be the case, or that the Chairman, if on the board of examiners, would reject a good design merely because it was Gothic. On the last point raised by Mr. Papworth, he entirely differed with him. To ask a fellow of the Institute to pass an examination, was absurd and impracticable; as it would in that case be impossible to draw the line between the examiners and the examined. If among the elder members of the profession, there were any wanting in some of the necessary qualifications, they would gradually die off, and their places would be filled by younger men. In conclusion, Mr. Bailey expressed, on the part of the members of the Association, their thanks to the Institute for the kind and prompt manner in which the subject had been taken up. The elder and the younger members of the profession knew far too little of each other, and if the agitation of the present question had done nothing more than bring them somewhat more into communication with each other, it would not have been brought forward in vain.

Mr. G. R. Burnell, Visitor, read the following statement of the course of examination in the School of Mines and the School of Engineers, in Spain.

Course of Study in the Special School of Mines.

Previously to 1847 it was necessary that candidates for situations of Ingenieros de Minas should pass the examination described below; and follow a course of study, also subjoined, lasting three years, before they could be admitted into that body.

The preliminary examination consisted of—

1. The presentation of a certificate that the applicant was not less than fifteen or more than twenty-five years of age, and that he had no physical or constitutional defects.
2. An examination in Arithmetic; Geometry; Algebra, as far as the solution of Equations of the second degree; application of Algebra to Geometry; Trigonometry, rectilinear and spherical; Practical Geometry and Conic Sections; Experimental Physics; General Principles of Chemistry; Lineal and Topographical Drawing; and the French Language.

The Course of Study consisted of—

FIRST YEAR.	SECOND YEAR.	THIRD YEAR.
1. Mineralogy.	1. Geology.	1. Construction.
2. Working of Mines.	2. Special applied Mechanics.	2. Practical Essays of Doximastics.
3. General Principles of Metallurgy and Doximastics.	3. Special applied Metallurgy.	3. Formacion de la cartera del Ingeniero. (Mode of keeping Records.)

Since 1847 this Course of Study has been altered thus:—

FIRST YEAR.	SECOND YEAR.	THIRD YEAR.	FOURTH YEAR.
1. Applied Mechanics, and mechanical preparation of the Ores.	1. Construction and Stereotomy.	1. General Chemistry.	1. Analytical Chemistry.
2. Mineralogy.	2. Paleontology.	2. Doximastics and general Metallurgy.	2. Special Metallurgy.
3. Geology.	3. Working Mines and Subterranean Geometry.	3. Administrative Law; 1st Part.	3. Administrative Law; 2nd Part.
4. Drawing and its applications.	4. Drawing.	4. Drawing.	4. Drawing.

Salaries, 5000, 6000, and 9000 reals.

COURSE OF STUDIES IN THE "ESCUELA ESPECIAL DE INGENIEROS DE CAMINOS, CANALES, Y PUERTOS."

Previously to 1847 the Course of Study lasted for five years, and was divided as follows;—

FIRST YEAR.	SECOND YEAR.	THIRD YEAR.
1. Integral and differential Calculus, and analytical Geometry of three dimensions.	1. Rational Mechanics.	1. Stereotomy.
2. Pure Descriptive Geometry.	2. Topography and Geodesy.	2. Civil Architecture.
3. Physics, and Principles of Chemistry.	3. Mechanics, as applied to Construction.	3. Mineralogy and Geology.

The Students were then examined, and they who passed continued.

FOURTH YEAR.	FIFTH YEAR.
1. Knowledge of Building Materials, formation of Roads, and ordinary Bridges.	1. Railways and Locomotive Engines.
2. Applied Mechanics, especially with reference to Steam Engines, and the elevation and distribution of Water for the use of Town Populations.	2. Rivers, Canals, Harbours, Drainage and Irrigation Works.
	3. Administrative Law, applied to Public Works.

In 1847 the Course of Study was altered, and its duration limited to four years. It is now conducted as follows:—

FIRST YEAR.	SECOND YEAR.	THIRD YEAR.	FOURTH YEAR.
1. Applied Mechanics.	1. Construction; 1st Part.	1. Construction; 2nd Part.	1. Construction; 2nd Part.
2. Stereotomy.	2. Machinery.	2. Civil Architecture.	2. Hydraulic Engineering.
3. Mineralogy.	3. Geology.	3. Administrative Law; 1st Part.	3. Administrative Law; 2nd Part.
4. Graphic and Practical Exercises.	4. Drawing, theoretical and practical.	4. Drawing, continued.	4. Drawing, and practical application of the various theories previously taught.

See Madoz' Diccionario, &c. vol. 10, p.p. 821, 822.

Having resided for eight years on the continent, he (Mr. Burnell) had ample experience of the diploma system, and it appeared to him that it had signally failed, and he believed, if adopted compulsorily in England, it would not produce any good result. The system in fact compelled those who aspired to public situations to go to the schools in which the particular education required for the diploma was given, and thus the tyranny of schools was substituted for the former tyranny of corporations. Moreover, a species of monopoly was established which was fatal to originality and individual character. The Chairman had stated that there was a species of examination for lawyers, but the system of "eating terms" which had so long prevailed had produced results of which, as Englishmen, they had no reason to be ashamed. The experience of the present war was not in favour of the system of examination in our own and other great military academies; indeed the only really great general, Omer Pacha, had not gone through the discipline of the schools. Again, the French engineers were, perhaps, the most learned and scientific body in Europe, but (with the exception of the improvement of the lighthouse introduced by Fresnel) none of the great modern improvements in engineering had originated in France. The application of cast and wrought iron to buildings, the improvements in suspension bridges, railways, docks, the electric telegraph, locomotive and other steam engines, gas lighting, &c. had all originated in England or America, where the profession was open to all comers and without monopoly; and this system, he was convinced, would be the safest and the best for the public. With regard to the consideration in which architects might be held by the public, the question was different, and certainly if a diploma had been necessary to practise as an architect, the public would not have heard so much nonsense as had been promulgated of late years by the various quacks who had thrust themselves and their schemes forward to attract public notice in matters of sewerage, drainage, &c. Whilst, therefore, he was decidedly against the diploma system, he admitted that as giving greater consideration to the qualified architect much good would be effected. This, however, was not a question which the profession, *quasi* architects, ought to take up. It had been urged in France that the introduction of diplomas would assure to architects a certain fixed position, and that many would be induced in consequence to settle in the departments. It was not, however, desirable that architects should put themselves forward as seeking to obtain better positions for themselves; they should only consider whether the interests of the public, truly understood, would be advanced by the plan proposed, and his (Mr. Burnell's) experience in all the countries he had travelled in went to convince him that it would be productive of a diametrically opposite result.

Mr. Pocock, Fellow, observed that in a profession embracing both art and science, a system of examination must involve uncertainty and difficulty. One individual, with great natural talent, might possess small yet sufficient acquirements in science and practice. Another, with a small but sufficient modicum of art, might possess so large an amount of science as to make a better display than he whom nature had endowed with more of the talent of the artist. The great difficulty in the question, indeed, would be in dealing with the distinction between the architect as compared with the mere builder, and in conferring a diploma which should properly point out the qualifications of each. Even *a priori* he concurred in the *a posteriori* conclusions of Mr. Burnell, that the diploma system would lower rather than raise the standard of professional ability. There would be a great difficulty in fixing the exact standard for the examination. Unless it were sufficiently high, a great many men who now aspired only to rank as builders would be able to pass it, and the modesty which now restrained them from passing off as architects would not be felt if they could obtain a diploma as being properly qualified. The consequence would be that the profession would swarm with obscure and unknown men, and not with the Cubitts, the Petos, and the Bakers, who were too glad to practice their art under the direction and with the assistance of architects. This result would at once destroy all the eclat which might otherwise be derived from the possession of a diploma. The only way of preventing this would be by raising the standard of examination so high that these larger bodies might not be able to pass. This however, would also defeat the object. It would, by running too much into detail, restrict very much the number of those who would conform to it as a voluntary examination, and in art especially there would be great difficulty as to the qualification. A man might read himself up in geometry, geodesy, or other matters of science, but the talent of architectural design could not be acquired; although any builder of good practice would be able to draw a portico, a summer house, or something equally elaborate. A diploma would doubtless be valued by a young man, whom the public might hesitate to employ without it, but if the title of architect was reduced in value by this proceeding, the young architect would no longer be thankful for it.

Mr. H. H. **Burnell**, Associate, stated that he had received communications from Professor Förster, and other foreign architects, warning the profession against the contemplated step as tending to trammel enterprise in every way. No doubt every young architect must find some difficulty from a deficiency of technical knowledge; but his principal difficulty arose rather from contact with parties with whom he had not hitherto been connected. They were necessarily exposed to the tricks of builders, and other evils, against which experience alone could protect them, and in reference to which any examination must be useless. It appeared to him also somewhat ungracious that any professional body should seek for an examination for themselves. In the other professions such a system had been adopted by the legislature, or enforced by society finding the necessity of protection. He did not think society felt that want very much as regards architects; and moreover, it should be remembered that before examination came instruction, and it would be necessary to have schools in which to instruct pupils in the subjects of examination, because at present in an architect's office the pupil only learnt experience and business. Mathematical skill of course could not be shown without an examination, but the possession of taste and artistic talent might even at present be displayed by exhibiting at the Royal Academy, and by competing for the prizes of the Institute, and the Association.

Mr. **Penrose**, V.P., thought, considering the course which the discussion had taken, it would be impracticable to come to any conclusion at the present meeting, as it was most desirable that the subject should be fully discussed. He trusted the objections which had been raised would not divert attention from the noble manner in which the Association had come forward. Tho discussion could not be limited to the principle of the question, as their judgment must be formed from a careful consideration of its details; although their decision, when arrived at, would be a mere affirmation, or not, of the principle. The danger pointed out by Mr. Burnell of the tyranny of schools would be a real and serious evil if not foreseen and obviated, and this danger the adoption of any thing like the Prussian system would peculiarly involve. In the analogous case of the Universities, the authorities, in preparing young men for the different pursuits of life, did not point out any particular line of study as fitted for any one profession; yet in the recent examinations for the East India Company's and other appointments, the Universities, and especially Oxford, had been very successful. He considered this an argument in favour of an examination for a diploma,—if it were not granted in an exceedingly concrete form,—or as pointing out one particular cut and dried line of architectural practice. The examination should rather be on certain subjects allied to architecture, and indispensable to the profession, but should be so contrived as not to hamper the student in forming original ideas. There could be no tyranny of schools in teaching geometry, the value and properties of building materials, the proper methods of estimating, or similar scientific points; but it required very delicate handling to know whether the artistic principle should be introduced at all. The danger which Mr. Pocock had mentioned of rendering the diploma too easily attainable, would, in his opinion, be more likely to ensue if the artistic principle were introduced in the examination, but this was a matter of detail which he would merely suggest for consideration. If the diploma merely ensured that the person holding it was duly qualified in certain indispensable studies, it would do much good, and would probably be better than a more decidedly architectural examination.

Mr. Jennings, Fellow, suggested that there might be different examinations and different classes of certificates, the mere passing of the ordinary examination being sufficient for a district surveyor. The examination for the district surveyorship had, in fact, already been thrust upon the Institute by the legislature. It did not appear to him that there would be any great difficulty in the artistic question, because the examination would rather be on the knowledge of what had been written, and was before the world, than on what the candidate could do with his own pencil. All examinations indeed must be as to the possession of knowledge, and there were rules which an architect would be expected to know, though a builder would be less likely to be acquainted with them. He thought the subjects might be so divided that the candidates might pass with more or less success; just as a person could regulate his own subjects in going up for honours at the Universities. There were some difficulties in the details of the question, but they were not insuperable, and he trusted the meeting would agree that some sort of examination was desirable. The Council *must* settle the kind of examination to be required for District Surveyors, and probably the best plan would be to refer the general question to the Council also.

Mr. C. Barry, Fellow, considered the practical working of the existing systems a matter of great importance. It was most desirable to learn their actual effects; or, believing them to be more or less failures, to ascertain why they had failed. He confessed that the schemes which comprised such a long list of acquirements, not only scientific and artistic, but of every discursive nature, seemed to contain within themselves the secret of their failure. It was the bounden duty of the profession to take such steps as might assure the public against malpractices, but he thought their labours should end there. The born artist would make his way with his natural endowments, which could not be taught, and which no examination could bring out. At the same time there were artists highly capable of influencing generations by their ideas of art and beauty, but perfectly incompetent to be entrusted with the execution of buildings. It was desirable, therefore, that such artists should be either associated with practical men, or themselves become practical, if any kind of examination could make them so. It was desirable not to confound the architect with the builder. The daily business of a builder, if a thinking man, must make him practical, but he questioned whether such a man would care to submit to an examination on those points; but it was important that an architect, who was not so evidently immersed in practice alone, should give some evidence of his practical ability. He therefore agreed with Mr. Penrose that the examination should be a practical one. A compulsory examination would contain the germ of failure, because it involved a degree of trammel and hindrance to original effort and exertion; and certainly it would be quite impossible to make it imperative on the old as well as on the younger members of the profession. The only object of an examination was to prove competency, and the fact that the older members of the profession had attained a high station was sufficient proof to the world that they were perfectly competent, and independent of any kind of examination that could be organized.

Mr. T. H. Lewis, Fellow, referred to the objection that without a stiff examination builders would be able to practice as architects also. His knowledge of first-rate builders convinced him that they would be able to pass a stiff examination; but a very slight qualification or undertaking would be sufficient to prevent their taking a diploma as an architect. They should declare before examination that they did not intend to practise as architects. He should be happy to see builders come forward and pass an examination, but it should be as builders, and as builders only.

Mr. C. Fowler, jun., Associate, called attention to a recent leading article in the Times newspaper in reference to the proposed "Nightingale Fund," the writer of which advised the promoters of the scheme "not to waste money on an architect," the idea evidently being that the province of an architect was merely to make an ornamental design, and that he had nothing to do with the practical or economical execution of it. That opinion was no doubt shared by a large portion of the public, and if it could be removed by granting a diploma, a great advantage would be gained; but there might be a doubt whether such would be the result.

Mr. I'Anson, Fellow, remarked that the common sneering at professional men was not confined to architects, being shared by the clergy, lawyers, and medical men. The question before them was, how far the public would benefit by the plan proposed, and he did not think it would be worth anything to the public. The public would go to clever men, no matter how they had got into the ranks. Sir Joseph Paxton, the originator of the Crystal Palace, was a striking instance of this; as he had now considerable practice as an architect. Rennie and Stephenson had risen, by their own genius only, to be among the greatest of modern engineers; and numerous other instances might be cited. A diploma would not keep out unqualified men. A builder with a little more pride than his fellows might become an architect, and, if he possessed talent, as good an architect as those who had gone through a professional career. A diploma might give confidence to young men, but they had already a diploma in having gone through an architect's office, and in having their articles endorsed. Upon the whole he did not see how a diploma could benefit either the public or the profession.

Mr. A. J. Baker, Associate, regretted that nothing had been said as to a more extended architectural education, a subject with which Professor Donaldson was familiar. A better education for architectural pupils was much required, and he hoped the subject would be taken up by the Institute on a future occasion.

Mr. Henman, Associate, observed that whilst architects of established position should not be subjected to examination, young architects should not at once obtain a diploma, placing them on the same footing as the senior members of the profession, The late Mr. A. Bartholomew had proposed examinations and diplomas of four different grades, and he (Mr. Henman) thought some such plan would be more feasible and practicable than that now proposed.

The Chairman stated that he was almost inclined to consider Mr. Papworth's proposal as a *joke*. So far as he (the Chairman) was concerned, there had, in fact, been no idea of subjecting architects already in practice to an examination. They would otherwise have to examine the examiners! The object he had in view was to elevate the profession. They were often told that English architects had no chance as compared with those of France. That he believed was a mistake; but if true, it was from the want of architectural education; and that education would be promoted by a system of examination. He did not ask the Council of the Institute, and the examiners who might be appointed, to examine *builders*—let the Builders' Society do that if it thought proper; the real object was to raise a body of scientific *architects*. He could perfectly understand a man ceasing to practise as a builder, and becoming an architect, but the custom of practising both as a builder and an architect was a grave blot upon this country, and he believed it was unknown in others. A distinct line of professional education should be required, and about which there could be no mistake; and the only way to effect that was by enabling students, after leaving an architect's office, or after a course of study under Professor Donaldson or Professor Hosking, to come to a body willing to recognize them, and inquire into their attainments, and to see that they had been directing their studies in the right course. The public would then know that the candidate had been well taught, and was competent to undertake their business. It was said the French system did not work well; but *there* a system of minute classification had been adopted which trammelled the mind. All such mistakes were easily avoided, and the whole plan should be as free as it could possibly be made. Some of the objections now urged arose from ignorance at what had passed at the former meeting. The majority of course would bind the meeting; but when the Government advocated an examination for District Surveyors, when one learned profession after another desired to institute examinations, and when the younger members of their own profession came to them and asked them for an examination, he put it to the meeting whether they ought not to adopt it. Notwithstanding the great names which adorned the legal profession, barristers knew that the present system did not ensure the attainments which their profession demanded, and therefore they proposed a system of examination. As the memorial before the meeting urged, it was the duty of the Institute to teach students of architecture the proper course of study, and there could be no better introduction into life and society than the fact of having passed such a voluntary examination as was proposed. Probably the suggestion of Mr. Jennings was the proper one, viz., that the subject should be referred to the Council; or, if the meeting thought fit, the discussion might be adjourned. In that case it should be understood that those who had brought the subject forward did not want it to assume the character which had been attributed to it by some of the speakers present. It was not at all meant in the sense of that evening's argument, but merely that a proper direction should be given to scientific education, and that they should if possible redeem themselves from the prejudice which existed abroad, that they were not as competent as foreign architects. The remark in the Times was meant to apply to extravagant and foolish expenditure, such as the erection of a fine Gothic building for the reception of a miserable collection of unhappy paupers. The public should be educated, so that they would not (as at present) choose the prettiest design offered in competition without regard to its appropriateness or expense. The Council were in the hands of the meeting as to the course which should now be pursued.

On the motion of Mr. ASHPITEL, Fellow, the discussion was then adjourned.

ON SOME FRENCH CHATEAUX OF THE AGE OF FRANCIS I.

By Edward I'Anson, Fellow.

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The subject on which I am about to address you is one which has no recommendation of novelty. The buildings to which I shall refer are, I doubt not, perfectly well known to you all, either from having actually visited them, or from pictorial representations; but it is on the very fact of the popular appreciation of these buildings, and on the pleasant memory of sunny hours which may have been passed by you within their precincts, and which may now be in some degree recalled to your mind, that I rely for whatever interest may attach to the subject I have the honour to bring before you.

I had indeed selected and in part prepared a subject of greater novelty to myself. I allude to the remarkable group of Byzantine churches at Perigueux and its environs, which have been touched upon by Mr. Petit in his Architectural Studies in France; but as I found they had been already fully described by Professor Donaldson, I have fallen back on a subject, which though more familiar, is, in its kind, not less interesting. I do not purpose to give any detailed chronological account of the dates of these buildings, or of the history of the times in which they were built. It is now, I find, ten years ago since I had the honour of reading in this room some account of the history of Renaissance art and its professors in France; but the subject appears to demand that I should as a preliminary refer to that connection which arose between France and Italy consequent on the wars of Charles VIII. in 1494; of Louis XII. who, five years later, invaded Italy, and of Francis I. who, crossing the Alps in 1515, there gained the battle of Marignan.

At that time, after ages of change and struggle, Europe had assumed nearly its present political division of kingdoms and states. Italy had reached a state of high cultivation; ancient literature, which had there never been wholly lost sight of, was revived; printing had just been discovered; religious inquiry had commenced, and the Reformation was about to take place; material riches had accumulated, society had become formed, and intellectual activity characterised the age.

In architecture the Alps divided two very different styles. On the north side, the colossal transepts of Beauvais were being built, and the lofty spire of that cathedral, which has long since fallen; whilst its cotemporaries, the spire of Antwerp and the unfinished tower of Mechlin, remain amongst the greatest works of any time or country. On the other side of the Alps, the great dome of Florence had been built, and the mighty fabric of Saint Peter's was progressing.

Irrespective of foreign influence, it is certain that Gothic art had outgrown itself; it had grown as a stately plant on the ruins of debased Roman or Byzantine art; at first slightly decorated by curling leaves, narrow, nervous, and sparse, as in our early English of Lincoln; developing itself little by little, growing more pulpy and full, as at St. Alban's nave or Beauvais choir; breaking out into more luxuriant branches, with the buds abundant, as in our early Decorated, and the flower expanding itself as in the days of our Edwards; until at last, in the full luxuriance of the French Flamboyant and the late German styles, both more beautiful and picturesque than our late Gothic, the flower had expanded sometimes to an unnatural size and bursting luxuriance, shedding its ripened seed; but whilst the flower grew, the original stem in French architecture had lost its form and significance; its roots had become crystalized into the most complex forms; in Germany the stem had been lopped and pruned, wreathed, intertwisted, and twined, until its early upward tendency was lost, and the style in both countries had grown into a still luxuriant but feeble condition. In this state it was ready to receive the impress of any new thought, and accordingly we find that no sooner had the French become acquainted, through their intercourse with Italy, with the revived classic architecture which flourished there, than they at once adopted it. Not that it had at first any perceptible effect on the structural character of their works, being only introduced as decoration; of which we have very excellent examples in the screen surrounding the lady chapel at Chartres, a Flamboyant work most elaborately and exquisitely wrought, with a profusion of ornament of the Italian Renaissance; and the arcade next the court yard of that part of the Palace at Blois, which is of the period of Louis XII., the whole of which is one of the most perfect and characteristic specimens which exist of the late Gothic of that Monarch's reign, and to which I shall again have occasion to refer.

The new style once having taken root was not, however, long in fully developing itself, and under the fostering patronage of Francis I., who ascended the throne of France in 1515, at the early age of twenty-one, it rapidly rose into great importance, and several remarkable works were produced which will always remain as models of true and original art.

Amongst the most important in point of size, and for its historical associations, may be noticed Fontainebleau, a spot not less known from its magnificent palace than from the natural beauties of the great forest which surrounds it. Fontainebleau, like most of the chateaux, is of old origin; an ancient feudal house, added to or destroyed, and new buildings raised in its stead. It was the favourite residence of Francis I., who made it the cradle of the arts, and the chief seat of his Court; from his day to the present it has been connected with the history of the French Kings, particularly so with the first Napoleon, and it owes much of its present splendour to the care of the lately deceased Monarch Louis Philippe. By his munificent patronage Francis I. here founded and maintained a school, called after him the School of Francis I.; and by his liberality have become associated with this palace the illustrious names of Leonardo da Vinci and Benevenuto Cellini, Andrea del Sarto, Sebastian Serlio, Primaticcio, and le Rosso. Primaticcio was the artist engaged for the greatest length of time; he had a fixed salary of 1200 livres a year, besides many marks of royal favour, and was assisted by Gio. Battista Bagnacavallo, Rugieri da Bologna, Prospero Fontana, Damiano del Barbieri, and Nicolo dell'Abate da Modena, which names I cite to show how much was done to introduce the revived Italian art. Fontainebleau continued to be the residence of the King, who here not only encouraged the arts, but also greatly increased the library. All the buildings round the Cour Ovale are of the time of Francis I., also great part of the Cour du Cheval Blanc, which was either entirely rebuilt by him or very much altered. He here sumptuously entertained Charles V, and on the occasion of the birth of his grandson, afterwards Francis II., born of Catherine of Medicis in 1543, he gave a great fête; and two years later, at a similar fête in honour of the birth of a princess, Henry VIII. of England was represented by Admiral Lord Dudley. Francis died in 1547, and to the last so great was his love of Fontainebleau that in going there he was accustomed to say, "Je vais chez moi." Henry II. and Diane de Poitiers his mistress, rather than his Queen Catherine of Medicis, reigned at Fontainebleau, and continued the work which Francis had begun. Catherine de Medicis, during her long regency, enriched Fontainebleau with statues, bronzes, and pictures; she made additions to the Cour du Cheval Blanc, and built a staircase in the place occupied by the present staircase du Fer à Cheval, which is a much later work.

The names of Henry IV. and Gabriel d'Estrées are next connected with the progress of Fontainebleau. Henry, besides other minor works, built the large court bearing his name, for the more convenient accommodation of his retinue; it is a distinct building, and wants much of the interest of the older buildings of the time of Francis. The other buildings of the Palace are all of later date, and of a style on which our attention is not now engaged. Henry IV.'s eldest son, afterwards Louis XIII, was born at Fontainebleau, in 1601.

The Chateau of Blois, the next to which I shall allude, is placed in the middle of the town. The most important part is of the time of Francis I., but it is highly interesting as a work of art of many ages, as well as from its historical associations. It is a considerable pile of building surrounding an open court, and referable to three very distinct periods:—one of or antecedent to Louis XII. the second that of Francis I; and the third one of a later date. Of the older buildings, are the Salle des Etats, a very fine room of the XIIth Century, and the Tour des Oubliettes, part of the old castle, which is now masked by the works of Francis I.

Louis XII. was the first royal resident of Blois, but it had already undergone considerable alterations and improvements under his father, Charles Duke of Orleans, who was long a prisoner in England. Louis XII. was born at the Chateau of Blois, and it was his favorite residence in after years. The exterior façade of the portion built by him was finished in the month of December, 1501. The whole of this building is a very remarkable work; it is of brick with stone dressings, and shews distinctly the incipient traces of the Italian Renaissance, to which I have before referred: it is considered by the French the most perfect specimen of late Gothic. As an example of domestic architecture, I know of nothing finer, and it has been very well given in a work published by Mr. Henry Clutton, in 1853. Louis XII. died in the year 1515, and the wing, known as the wing of Francis I, commenced by Louis, was carried on and finished it is said in three years. Next the court yard, its principal feature is its beautiful staircase; and the façade next the town rising from a rocky elevated base, and owing much of its dignity to the commanding site on which it stands, is a most graceful and dignified composition. The massive natural base on which it stands, supports a range of building consisting of three stories, surmounted by an open colonnade. The windows are, for the most part, deeply recessed and divided by flat pilasters, whilst three projecting windows, and one projecting balcony, diversify the general breadth of design in the happiest manner. The more modern portions of the palace were chiefly added by Gaston of Orleans, brother of Louis XIII.

Blois, which was in a very dilapidated state, has been nobly restored as to that part which is of the time of Francis I. This work is due to the care of the King Louis Phillipe, and has been most ably carried out by M. Duban, at a cost of 400,000 fr. (£ 16,000.) All the external sculpture has been carefully and successfully renewed—the glazing entirely replaced—the floor paved with tiles (the best rooms with encaustic tiles); the walls lined and decorated, the wooden ceilings redecorated, and the panelling to various rooms, and some magnificent chimney-pieces restored, the whole interior coloured, and in some rooms richly gilt; some part of the exterior colored and gilt; forming altogether the most perfect and pleasing example of the age of Francis I, which is in existence.

This building is now used partly as a museum, and partly for occasional festive meetings of the townsfolk, and at the period of my last visit, a few months since, its chambers, once the abode of Royalty and long the favorite residence of the House of Orleans, had served as an elegant series of ball rooms for the inhabitants of Blois. The great feature is the noble staircase. On each floor, one half the building next the court-yard is occupied by the Salles des Gardes, and the other half by a series of rooms of various sizes, generally with no communication except through each other and into the Salle des Gardes.

The next building to which I would refer, is Chambord, built in the year 1523, by Francis I. Henry II. continued the works, and it is said that these two Kings had 1800 workmen employed upon them for thirty years. It was altered by Louis XIV, and disfigured by his architect Mansard, who divided the noble internal galleries into two stories, by wooden floors, and also materially altered the low building at the back, in order that it might accommodate the numerous retinue of the Grand Monarque. The building measures in front 80 toises, and is 60 toises deep; the four corners are flanked by four great towers; those at the back are now low, but in Ducerceau's view they are as lofty as the principal elevation, and thus materially add to the beauty and effect of the whole design. In 1749 they were low as they now are. The outer buildings enclosed an inner building, also flanked by four towers, the centre building is called the donjon. Each of these towers is 60 French feet in diameter. The central staircase is 30 feet in diameter, and from it radiate in the form of a Greek cross, four Salles de Garde, each 50 feet long, and 30 feet wide. These Salles de Garde are vaulted in stone, and have flat roofs. The panelling of the vaulting is ornamented with an alternate F, and the Salamander; the roofs are ornamented by quantité de cheminées très ornées, quantité de tourelles et croisées qui semblent récréer la vue de ceux qui se promènent sur ces terrasses. The central tower, about 100 feet high, is very much praised, the writer from whom I quote, an author of about a century ago, says it produces "le plus gracieux effet du monde." There are 13 staircases, and 440 rooms in the château. The design is attributed to Primaticcio, but that it is really his appears very doubtful.

At present, this noble building is by no means in a satisfactory condition. It belongs to the Comte de Chambord, by some known and hopefully looked up to as Henry V. of France. His portrait hangs up in the little but excellent inn adjoining the palace, the only habitation, except a religious house, which obtrudes on its desolation. On my pointing it out to the hostess, she referred to it with an evident expression of hope, and looking forward to better days to come, and only answered my doubting remarks by saying—"Ah, Monsieur, au bon Dieu, toutes les choses sont possibles."

In 1793 it was despoiled internally, and greatly defaced externally; and the domain being about to be sold, and the castle broken up, in 1821, it was purchased by the people during the reign of Charles X., and presented to its present owner. Its situation is the very reverse of picturesque. It stands in a flat country, three or four miles from the banks of the Loire, and in just such a monotonous position as Wolsey, at about the same epoch, chose for his palace of Hampton Court. The fossés which anciently surrounded it are now filled up, but can be easily traced; its last resident was King Stanislaus of Poland,* whose apartments are still preserved in a habitable state, but all the rest of the building is utterly stripped of all internal fittings, and presents a scene of perfect desolation and departed grandeur, to which may almost literally be applied the touching verses of Hood—

> No dog was on the threshold, great or small,
> No pigeon on the roof, no household creature,
> No cat demurely dozing on the wall,
>   Not one domestic feature.
> No human figure stirred to go or come,
> No face looked forth from shut or open casement,
> No chimney smoked, there was no sign of home
>   From parapet or basement.

Ducerceau, who wrote as an old man, about 1560, thirty years after the building was erected, speaks of it thus :—

"La commodité du dedans a esté ordonnée avec raison et sçavoir. Car au milieu et centre est un escallier à deux montées percé à jour et entour iceluy quatre salles, desquelles l'on va de l'une à l'autre, en le circuissant; aux quatre encoigneures d'entre chaque salle y a un pavillon, garny de chambre, garderobbe, cabinet et montée. Plus és quatre coings de la masse de tout le bastiment se voyent quatre grosses tours, garnies à chascun estage de toutes commoditéz, comme chambre, garderobbe, privéz, cabinets et montée.

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* 1725.

Notwithstanding what Ducerceau says about the commodité of Chambord, it is extremely difficult to understand how any comfort could have been found in it; all the large rooms being given up to the guards, and the remainder are very small, scattered, ill-contrived, and reached by long galleries or open staircases. Blois is much the same, but the principal rooms are of greater dimensions, and certainly better arranged. Chambord was a very favourite residence of Francis I. When the works executed during his reign were well advanced, it was visited in 1539 by Charles V. of Spain, when he traversed France; and in the declining days of Francis, it was much resorted to by his sister, the Queen of Navarre, whom Francis called his Marguerite des Marguerites. It continued to be occasionally resorted to by the French monarchs, and particularly by Louis XIV, who first came here that he might conceal his royal amours from his mother the austere Queen of Austria. The grand monarque visited the chateau for the last time in 1684.

Alfred de Vigny, in his novel of Cinq Mars, describing this building, says:—"on conçoit à peine comment les plans en furent tracés et dans quels termes les ordres furent expliqués aux ouvriers, cela semble une pensée fugitive, une idée brillante qui aura pris tout à coup un corps durable, un songe realizé." And another more recent writer, not less enthusiastic, says:—"quelle qu'ait été la pensée qui a enfanté Chambord, elle a sans contredit créé la Merveille de la Renaissance, cette époque qui a fait surgir du sol Européene tant de prodiges n'a rien inventé, rien laissé de plus beau et de plus saisissant." And another old writer says, the Palace of Chambord, "est bien le plus merveilleux en toutes piéces rares qu'il y ait en Europe, et comme abrégé de toute l'industrie humaine de son temps."

On a smaller scale than either of the preceding, is Chenonceaux. It was built by one Thomas Boyer, chamberlain of Louis XII, who following the example set by Francis I, sometime after 1496, when he bought the estate, built the present chateau, or rather commenced it, for he died in 1523, leaving it unfinished; after which it became a royal palace, and the property of Francis I, who frequented it often with Catherine of Medicis. By Henry II. it was given to Diana of Poitiers, who rebuilt the principal façade, and constructed the elegant gallery over the river. This gallery is called the Salle des Gardes, but is said to have been built by Diana of Poitiers to communicate with the left bank of the river, "ou se trouvait un Sylvestre et plantureux boucage arrosé de fontaines et verdoyant comme un pré d'avril." On the sudden death however of Henry II, and the advent to power of Catherine de Medicis, Diana of Poitiers was obliged in 1560, to exchange the chateau for that of Chaumont, near the Loire. This same year, our Mary Stuart visited Chenonceaux. Catherine retained this chateau until her death in 1589, when she bequeathed it to Louise of Lorraine, wife of Henry III. Chenonceaux is a simple building in its form, as indeed all the buildings of that time are. It is a parallelogram on plan, with a chapel annexed on one side, and the great wing extending over the river at the back. The chapel, like that at Ecouen, is built in what appears to have been the conventional ecclesiastical style of the day, very similar to the church of Saint Eustache, at Paris. The principal façade is rather more massive in its treatment, the cornice more strongly marked than those at Fontainebleau and Blois. There is a round tower at some little distance in front of the chateau, but unconnected with it; it is of the same date, but its use as part of the building is quite problematical, unless it were, as at present, a lodge to the main building. This chateau is now private property, but may be seen even when the family is in residence.

I may cite also the Chateau of Anet, now demolished, which was the work of Philibert de l'Orme. In this building every resource of Art was used to produce a perfect work. And the small portions which remain attest a great refinement, a marked advance on the works of Francis I's. reign, and much elegance of design. The interior of the apartments were covered with panelling, executed with extreme care and richness under Jean Goujon, and the painted windows were the work of Jean Cousin.

Before Philibert de l'Orme had completed Anet, Jean Bullant was employed by the Constable of Montmorency to build the Chateau of Ecouen; this is a fine work, but the architect in some portions has been too anxious to copy the antique servilely, not accommodating it, as had been done so well in some of the other buildings I have referred to, to the feudal form of building to which it is applied, and the steep roofs which surmount it. On this work, amongst other distinguished artists, Bernard of Palissy, is said to have been employed. Ecouen is about six miles from Saint Denis; it is now used as a seminary for the daughters of the members of the legion of honour, and is not accessible to the public.

I may also here refer to the old façade of the Hôtel de Ville at Paris, a well known example of the era of Francis I. Ducerceau, who wrote during the Regency of Catherine de Medicis, towards the latter end of the sixteenth century, enumerates and gives plates of no less than eighteen Royal Chateaux: Blois, Amboise, Villiers Costerets, Charleval, Les Thuilleries, Sainct Maur, Chenonceaux, Le Louvre, Vincennes, Chambourg, Boulongne dit Madrit, Creil, Coussy, Folembray, Montargis, Sainct Germain, and La Muette. Writing after the wars of Francis I. and his successor—the very wars which appear to have imbued the French monarchs of that time with their love of splendour, he says, "J'ay pensé ne pouvoir mieulx à propos mettre en lumiere ce premier Livre des Bastimens exquis de ce Royaume: esperans que nos pauvres François prendront, peult estre, en respirant, quelque plaisir et contentement, à contempler icy une partie des plus beaux et excellës edifices, dont la France est encores pour le iourd'huy enrichie." Of these some are of early date, and several are now gone—swept away chiefly by the ruthless hands of the destroyers during the anarchy of the French revolution. The Chateau of Madrit, built for Francis I. by Pierre Lescot, 1540 to 1550, must have been a very noble example; some of them, as the Chateau of Chantilly, have still an enduring name; of some, as the Chateau of Gaillon, built for the Cardinal d'Amboise by Fra Giacondo, a Venetian architect, and the Chateau of Anet, to which I have already alluded, fragments are preserved in the courtyard of the Ecole des Beaux Arts at Paris; and of some I have this evening offered you a more full account.

In considering these fine monumental palaces, perhaps one of the most striking features is the staircase. It was a feature which had received considerable attention from the later Mediæval architects. All of them are constructed on the principle, no doubt derived from the earlier turret staircases, of a central newel. There is a well known instance in the Flamboyant style of a beautiful wooden staircase leading to the organ gallery at the Church of Saint Maclou, at Rouen, and another, not perhaps quite so well known, but which is a most elegant and elaborate effort both of taste and construction, a stone staircase in a house situated very near to the Cathedral of Strasburg, the design of which, with very excusable gallantry, is attributed to the daughter of the architect of the mighty cathedral; it is a work indeed requiring the utmost precision and nicety of constructive skill, whilst it is exuberant in fancy and decoration. We have also the two staircases of the Corps de Logis of Louis XII, and several other examples might be cited. The staircases of the chateaux we have been considering, are, however, generally of larger proportion than the earlier works referred to, and at Chambord the architect has indulged his taste by building no less than thirteen staircases. One of the noblest external staircases with which I am acquainted, I believe the very noblest, is that at Blois; the spiral turn of the stairs is adopted as the leading feature of the design, to which all the rest is subservient; and whilst there is considerable massiveness and solidity of construction, the octangular form of the building and the inclined lines of the staircase intersecting give a remarkable playfulness to the design, and the great beauty of the sculptured decoration adds that prevailing grace which is one of the chief characteristics of the architecture of this epoch. The central internal staircase at Chambord, circular on plan, is also a very fine work; it is of considerable size, being thirty feet in diameter, and there is a double flight, one under the other. The central newel is not absolutely solid, there being a hollow core, which extends from the ground level up to the upper part of the beautiful central turret of the chateau. The double flight ceases at the level of the terrace, and a single flight continues to the upper part of the central turret. The decoration of the staircase is admirably carried out, the various capitals of the flat pilasters, adapting themselves to the horizontal and inclined lines of the entablature which they support, are all beautifully wrought. The angle staircases in the court yard, of a somewhat later date than the central staircase, surrounded with open colonnades and crowned with dome shaped roofs, surmounted by the fleur de lis, are also elegant compositions.

Certainly however the great feature of all these buildings is the roof. Ruskin has remarked, that the first and most characteristic feature in a building is the roof—that the first ingredient of a habitable building is the roof—and it has long been observed how distinctive a feature it is—and how, as a general rule, its inclination may be taken as a proof, if I may so express it, of its original geographical position. Now, in this country and in France, in the later times of Mediæval architecture, the roof took a very different growth; with us it grew flat, in France and Germany it grew high and steep. Rickman observes, in his "Styles of Architecture," that in our late Gothic, one of the distinguishing features is the embattled parapet. The roof had at that time so generally become flat, that some relief and finish to the wall, and indeed, some breast-work or protection to those using it were required; and they copied the parapets of our castles, retaining by tradition, and probably for more richness of effect and diversity of outline, the battlement also; which became so indispensable a feature with our late Mediæval architects, that they introduced it, as a decoration even on the transoms of the windows. Together with the four centred flat arches they used the flat roofs, and with the flat roofs embattled parapets, and the church towers were built without spires, and finished also with parapets.

Now in French Flamboyant, that latest and, to my mind, very beautiful school of French art, the proportion became more elongated; the flaming of the tracery influenced the upward growth of the building; the lofty narrow window also caused it to grow in height, and the roof grew with the rest of the building; and particularly on the tower, when spires had also fallen into disuse, the roof assumed almost the inclination, if not the place of the spire, and the conical roofs to the circular angle turrets were in fact true spires, but being somewhat less elongated in form retained the character of roofs. The roof with its over-hanging eaves and the cornice which supported it, rendered the parapet unnecessary as a matter of ornament; and as the roofs were inaccessible except by means of ladders attached to the projecting hooks which we so commonly see on the steep roofs of French buildings, the parapets were also unnecessary as a matter of use, and thus in French late Mediæval work, the parapet is of very rare occurrence, indeed I do not remember any example of it. I allude rather, however, to these features of French architecture, because it seems to explain the tendency to high roofs, which to this day prevails in French architecture, and although they are incongruous when applied to strictly classical architecture, yet they are not so in connection with the particular style of these chateaux, and the extreme picturesqueness which they give wherever they are applied is quite a sufficient reason for their being maintained, and an inducement to harmonise the lower part of the building with the lofty roof, an effort to accomplish which is readily to be observed in many modern French buildings; and, indeed, all that appears necessary to attain this is to develope the predominance of the upward lines of the decorations, and to suppress the importance of the cornice, which in buildings where the roof forms the crowning ornament is not of the same importance as in classical buildings, where the roof is a very subordinate feature; and recurring to Ruskin's observation that the roof is the great feature of any habitable building, the architects of the French Renaissance would appear to have been fully imbued with this principle. I may, before leaving this part of the subject, observe that although the Italian architects employed at Fontainebleau had introduced and practised a correct proportion in drawing the human figure in the mural and other decorations in this school of design [for such Fontainebleau then actually was] the French artists, influenced by the traditional feeling of the Flamboyant School, actually elongated their human figures, and allowed this tendency to give a marked character to all their works.

Although in the buildings of the time of Francis I. there is a very evident reference to the revived schools of classical architecture, still there is no servile copy; indeed, there is no part of the decoration in particular which does not, more or less, bear a very distinct and separate character from its type. The proportions of all the mouldings of the cornices and string courses at Blois, Fontainebleau, and Chambord, are very much exaggerated, as in Prout's drawings; they are all coarse, and but rude copies of the best Italian work; there is however a great vigour gained by this treatment, and the peculiar cornices of Chambord and Blois, although not to be compared in elegance with Italian work of the same time, yet have a rude and massive character which gives considerable dignity to the work. The projection of the pillasters is small; the arch mouldings and architrave mouldings are generally delicate and of better profile than the main cornices and string courses, and the decoration of the capitals and carved panels is of a character often of extreme delicacy, and always of great and peculiar beauty, and there is an exuberant fancy in their varied design. The representation of foliage is perfect, and the best adapted for architectural decoration of any school of art. Cyphers and emblems, figures and animals, are sometimes introduced, but the animal carving does not equal the flowing racy vegetable form of the foliage, and at Chambord it is certainly very inferior.

The buildings of this age are very much ornamented with the emblems and cyphers of their owners; a practice indeed, which, as to the cyphers, has been continued in France to our day to an extent much beyond what prevails amongst us. The F for Francis, surrounded by the Cord of Anne of Britany, and the Salamander his emblem, and sometimes his motto "Nutrisco et Extinguo," are common on all the works of his period, whether they are Renaissance as at Blois, or Flamboyant as in the transepts at Beauvais. H for Henry, and his emblem the Crescent, also the emblem of his mistress, which he did not scruple constantly to use on the buildings of his reign: at Chambord, indeed, no opportunity seems to have been lost of displaying the royal H and the Crescent interlaced, also the two ᗡ–D connected forming H and D, and at Fontainebleau they are even used in the chapel. The Porcupine was the emblem of the ancient house of Orleans; the Ermine of the house of Britany; une Cordelière, of Queen Anne of Britany; and the S with a Dart through it was the emblem used for the name of the mistress of Henry IV. Gabriel d'Estrees.

I might allude to other points of interest, and draw some comparison with our own palaces of somewhat similar character but of later date, and remark on the number, great extent, and magnificence of the royal domains I have so inadequately referred to; the use of which, even in imagination, never seems with us to have been contemplated except in the one instance of Whitehall, of which we possess so noble a fragment. But I now conclude, having accomplished the object I had in view of briefly calling to your mind the memory of a well defined and highly interesting class of buildings.

Mr. **Mocatta**, Fellow, confirmed the remarks of Mr. I'Anson as to the extreme care bestowed by Louis Philippe on the restorations of Fontainebleau; the cost of such restorations and their extraordinary magnificence being perfectly astonishing. The splendour and magnitude of the great French Chateaux gave a peculiar interest to the national history of France, and contrasted forcibly with the comparatively small and insignificant edifices of the kind of this country.

Mr. **Fowler**, Fellow, had received a very favorable impression of the works at Fontainebleau, which he had seen in active and satisfactory progress, in the year 1841. In carrying out the train of associations excited by the contemplation of such works, it was impossible not to observe that whilst both Louis Philippe and the prespet Emperor of the French had expended very large sums of money, from their own resources in addition to those of the nation, upon these restorations, yet the works were not suspended when the reign of Louis Philippe came to a close, but were in full progress under the Republican form of Government; a fact which must be considered highly creditable to the national character.

Mr. **I'Anson**, in reply to an inquiry as to the irregularity of plan in the Château of Blois, said that it had been founded upon an older building. He understood that the restoration of one wing at Blois had cost £ 16,000.

Mr. A. J. **Baker**, Associate, suggested that it might be desirable, in the present practical age, to obtain information as to the exact reasons which had led to the adoption of the extremely high pitched roofs, which presented so remarkable a feature in the chateâux in question.

Mr. **Parris**, Visitor, called attention to the decorations of Fontainebleau, and especially to the frescoes by Primaticcio. When the restorations were commenced there, it was stated by French artists that these works would not resist the action of damp; and he, Mr. Parris, went over on purpose to ascertain the fact. He found that the roof had been completely off, and the wet had penetrated and burst the plastering off the walls, which was lying down split in all directions. He picked up several pieces, and found that the colouring was as perfect as when it was first executed,—the plaster having merely been thrown from the wall, but the paint not detached from the plaster. Several experiments had been made with a view to the restoration of the paintings, and the result was that they had been restored with a wax medium, none of the fresco being left. It appeared clearly that it was not the fresco, but the plaster which had failed, by the damp getting behind it; and, with regard to the general question of the permanence of fresco painting, it was satisfactory to know that our plaster was as good as any of that of ancient Rome, and certainly superior to that employed at Fontainebleau. Wherever the walls of a building imbibed moisture from the air, or from the ground, the plaster was liable to be thrown off. This had taken place in ancient Roman buildings, where the lower parts of the frescoes were damaged.

Mr. J. G. **Crace**, Visitor, observed with reference to Chambord, that he had always thought it could only have been constructed as a place for conviviality, and for the assembly of a large number of persons in the hunting season in one large hall; the other apartments being all of small dimensions, and adapted only for bed chambers. Mr. Crace adverted to the peculiarly curious arrangement of the double spiral stair-case in the centre of this château. With regard to fresco, he had known instances where the action of damp in the atmosphere had affected the colouring and quality of the plaster. In London, he imagined the lime would attract the smoke, and that in forty or fifty years the pictures would become blackened by absorbing the carbon of the atmosphere, and certainly would not present so good an appearance as those painted in oil, encaustic, or any other vehicle, whilst the dead appearance of fresco might be obtained, if desired, by adopting a proper medium. He considered that polychromy had been very successfully applied to the exterior façade of one part of the Château of Blois, a portion of which was shewn in one of the drawings.

Mr. I'Anson, called attention to a number of black lozenge-shaped ornaments on the exterior of the chimney shafts at Blois. These were singularly effective, though very simple, being merely pieces of slate fastened to the stone work, and not, as they appeared to be, marble inlaid.

Mr. Foggo, Visitor, said that Mr. Parris in using the term *plaster*, had adopted the expression which had led the French artists astray. Sulphate of lime was not the proper vehicle for fresco, nor would it endure at all. With regard to the vast expenditure of the French monarchs, it should be remembered that Francis I. lost a battle and his liberty because he was unable to pay his army; and that Louis XIV. brought France to the brink of bankruptcy. A little more discretion, judgment and good taste, might have enabled these sovereigns to do as much good to architecture, and to benefit the nation still more.

Mr. Parris thanked Mr. Foggo for his correction. By fresco, he meant paintings on plastering formed of pure lime and sand.

The Chairman, Mr. Godwin, Fellow, proposed the thanks of the meeting to Mr. I'Anson. It was pleasant to see that gentleman returning, after a lapse of ten years, to a subject he had already illustrated, and with as much ardour and vigour as before. He (the Chairman) would only caution the meeting against adopting literally the enthusiastic phrases of the French authors quoted by Mr. I'Anson; for although Fontainebleau and Blois were exceedingly picturesque and interesting when seen at a distance, they would be found weak in detail upon close examination, and not to be compared with the Gothic edifices upon which their outline was evidently founded. The subject of external polychromy was always interesting, and the recent applications of it in Regent Street by Mr. Owen Jones, and in Tottenham Court Road by Mr. Lockyer, together with other instances, proved that a strong disposition existed to apply it to modern architecture.

After the thanks had been acknowledged by Mr. I'Anson, the meeting adjourned to the fourteenth of January, 1856.

REMARKS ON THE FORMS, METHODS OF CASTING, AND RINGING OF LARGE BELLS, WITH SOME SUGGESTIONS ON THE SUBJECT.

By C. H. Smith, Honorary Member.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, Jan. 14th, 1856.

The subject for consideration this evening is rather of an unusual kind, and one in which I am by no means deeply versed. But amongst the company present I observe many gentlemen eminently distinguished for their attainments in physical science; I therefore depend on the acuteness of such members and visitors in detecting errors, should I be wrong; and on their candour, in admitting my observations, if right. In fact, I wish the subject to be thoroughly discussed, and only to be allowed myself to act as one of the speakers.

I am aware of the old saying, that "it is much easier to find fault than to suggest a remedy;" this is perfectly true in the present instance. I feel assured that the long established system, connected with the manufacture and use of large Bells, is attended with many serious inconveniences; and that a vast opening for improvement exists, whether we regard the form, the mode of casting, or the usual method of ringing them. And although I can confidently point out difficulties and objections, I candidly admit that I am not prepared to offer positive improvements or remedies. There is scarcely a bell tower in the kingdom, which is not shaken to a certain extent, and the masonry disturbed; in some cases fissures of a dangerous character are formed from top to bottom; in others the ringing is altogether discontinued for fear of the oscillations bringing down tower, bells and ringers to the ground in one common ruin. If any one will seriously consider the operation of raising a body weighing ten or fifteen tons (a weight greater than any stone used in the erection of the British Museum, the Post Office, or the Royal Exchange) to the elevation of 150 or 200 feet from the ground; and, when so raised, whirling it in the air until the arc of oscillation becomes a complete circle; then, in addition to the simple gravitating weight, make a calculation of the centrifugal force in ringing, he will only be surprised that the towers and the buildings adjoining them are not more frequently destroyed by such violent proceedings.

Mr. Ferrey, who has had frequent opportunities of becoming acquainted with the subject, has written to me as follows:—

"You wish me to state what I have observed in the towers which have come under my professional notice, as to the effect of the mode of bell hanging hitherto adopted. My remarks apply rather to the bad consequences arising from neglect or ignorance, than to the principle upon which Bells are generally hung in towers and campaniles, in the frames technically called cages. Still, if some plan of bell hanging could be adopted less liable to derangement than the framework commonly used, much mischief to church towers might be avoided.

"In the course of my examination of many ancient churches, I have frequently had to deplore the serious injuries caused to the towers by the action of the bells. However judiciously they may be arranged within the framework, there will naturally be some unequal strain upon parts of it; no sooner do the ringers find a difficulty in raising the bells, owing to the want of a proper bearing on the gudgeons, than they immediately begin wedging up the framework of the bells from the walls, window mullions, or any masonry nearest to the point where the bell which works heavily is placed; no attempt is made to brace the woodwork and so remedy the defect, but in order to prevent further spreading, struts and wedges are placed between the framing and the walls of the tower. With a heavy peal of bells the disastrous effects of this slovenly system must be obvious; the great vibration arising from the revolution of the bells is at once thrown upon the walls, and the damage resulting from it becomes very soon apparent. Our ancestors meant to avoid danger from this cause, and I do not know an instance of any importance, where the tower walls are not provided with ample set-offs and brackets on which the old bell framing was placed perfectly free from the surrounding walls, and generally with a space sufficiently wide for a person to pass round the bells; the whole framework resting upon these set-offs as a dead weight only, no timber of any kind being inserted in the walls. If this plan was properly respected, and the framework carefully kept free from the walls, much structural injury might be prevented; but even then the oscillation which occurs must eventually damage the building. I have been in old towers while the bells were in full peal which have *rocked* to such a degree as to cause me alarm, and the quivering vane, and tremulous motion of other parts have given full proof of the extent of the vibration. In some central towers, I have observed much injury to the supporting arches and piers; as in the case of the tower of Othery Church near Bridgewater, the structure was rendered dangerous by the manner in which the tower piers were split and crushed by the action of the bells. In many instances, the belfry chambers are closed against the ringers, and the bells are only permitted to be *tolled*, owing to the dangerous condition of the towers. Very recently steps have been taken to rebuild the upper part of the spire of Bellbroughton Church near Stourbridge, the masonry of which was so loosened by the vibration of the bells, as to become quite dangerous. I could mention many other instances which have come under my notice of the serious results arising from bad bell hanging, and ignorant attempts to remedy the evil, but I have no doubt that other professional men will supply you with examples. I hear that you are proposing some new form of bell, by which the same musical tones can be produced, without the necessity of their being put in such violent motion. If you succeed in this, and can give us the same joyful effect without the necessity for cumbrous wooden framework and risk to the buildings, you will have effected a very desirable object."

I may also call your attention to the following, remarks by the Rev. W. C. Lukis, in the Wiltshire Archæological Magazine:—

"It is a matter for our grave consideration, how it comes to pass that so many of our village churches should have their towers in so dilapidated a condition. I have seen several in the course of my Wiltshire rambles, which are in so dangerous a state that the bells are forbidden to be rung. There can be no doubt that this arises from two causes. In the first place, bells for which the towers were originally constructed were not subject to the same revolutions and tossings as now. They were swung to and fro, it is true, but very gently compared with the present wild summersets of change ringing, an art of comparatively recent date. Consequently, in constructing the towers, the architects of those days had not to take into their calculation the great vibration of the walls produced by the violent motion of the bells. In 1810, the spire of St. Nicholas' Church, Liverpool, fell as the people were assembling for service, and killed twenty-three persons. This catastrophe was partly caused by the vibration of the bells. Any one who has stood in the belfry of the lofty and beautiful tower of Magdalen College, Oxford, when a peal is ringing on its ten sweet-toned bells, knows the way in which a tower is made to sway. To a person of weak nerves it is perfectly alarming, and it is easy to understand how this kind of vibration must loosen the masonry, and eventually endanger the building."

That the process of throwing bells up and down is inconvenient as well as dangerous is proved by the fact, that nearly all large bells are struck on the outside with a hammer, instead of being whirled round; either because the tower is in a dilapidated state, or that too many men are required to raise the bell, if it is to be rung according to the original intention of the machinery.

The most sonorous material for bells is found to be a mixture of copper and tin in certain proportions, generally four parts copper to one of tin. It is an error to suppose that silver enters largely into the composition of some bells, though the recently discovered metal, aluminum, is said to be very sonorous. The greatest care is requisite during fusion not to heat the materials more than absolutely necessary; and when melted and sufficiently hot, to commence casting them with as little delay as possible; for metals in a fluid state may be distilled or sublimed by heat like other liquids; consequently, the tin being melted at a much lower temperature than the copper will be driven off in a sort of aeriform or vapourous state; therefore, in order to be certain that, when the bell is finished, it shall contain the proper quantities of each metal, great importance must be placed on putting in the tin at a proper time, or when the cast is completed, its composition will be different in its proportions from what was intended; this will, of course, alter the sound, and very likely render the bell less sonorous. If the bell is to be a large one, the metal must be fused at several furnaces, varying in intensity of heat, and some ready for the mould before the others; but wherever two or more currents of fluid metal meet, the rudiment of a fracture may be formed, as the chances are, that portions of oxide, or earthy matter, floating on the surfaces, may prevent the perfect junction and incorporation of the two streams.

It is a common practice to pour hot metal into a cold mould, or into a mould that has been warmed on the surface by pouring a small quantity of the fluid metal into it, and then, by some contrivance, letting this metal run out again before it has had time to become solid; this plan will give a momentary warmth to the surface of the mould, or perhaps may warm it to the depth of half an inch, but it will not prevent the hot fluid metal when poured in from becoming solid wherever it touches the mould, while the interior of the mass will still remain in a liquid state. Under such circumstances, the cast will be tolerably fine-grained, solid and compact, where the metal has first cooled, that is, wherever it has come in contact with the mould; but inside, where the fluid metal has not been so immediately cooled, but has remained longest in a melted state, the texture will be open, coarse-grained, porous, and highly crystalline.

If it is the general opinion, that no better form* for bells can be introduced than that which has been in use for ages, namely, the various modifications of a hollow cup-shape, we must endeavour to find some mode of improving the contour, and process of manufacture; so that cracks in the bells, and destruction of the towers, together with many other vexatious incidents, may be much less frequent than heretofore. Whatever the general external and internal form of a bell may be, the plainer the surfaces the better will be the sound; all moldings, inscriptions, dates, and every kind of ornament, whether projecting or indented, should be avoided; as they interrupt the free vibration of sound, in proportion as the relief is high or low; and are therefore worse than useless on an object that is intended to please the organ of hearing, infinitely more than that of seeing. A small bell finished in a lathe will sound better than one rough from the mould.

To produce sound, bells are usually struck by a clapper within, or by a hammer on the outside: such continued battering upon a cast, or crystalline substance must, sooner or later, crack the metal. This may happen when the bell is quite new—soon after it is placed in the belfry—or not for several centuries. A number of comparatively insignificant hammerings, or concussions, will produce a very surprising effect, if continued for a long period. The fracture may, at first, be so trifling as to be almost inappreciable by the most refined ear; but every stroke of the clapper will increase the evil, until the vibrations of the metal are so interrupted that, instead of a long continued harmonious sound, an unpleasant jarring noise is produced, and the bell becomes useless. Mr. W. L. Baker's plan, proposed in his paper on bells read here last year, of gradually turning the bell round, is a great improvement.

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* See diagram showing the forms which have been used, from a flat plate of metal to the complex ogival bell. The paper was also practically illustrated by experiments.

The loudness of a bell will depend upon many circumstances in addition to its magnitude, weight, or the violence with which it may be struck. A calm and frosty atmosphere is favourable to the transmission of sound; violent winds and other ærial agitations interrupt its progress. When a strong wind blows from the hearer towards the sounding body, a sound often ceases to be heard, which would be distinctly audible in a calm.

Various circumstances have led me to consider whether a totally different form from that usually given to bells might not be introduced with advantage. Large blocks of stone are sometimes accidentally placed so that they balance on a small lump, immediately under the centre of gravity: while in this position, if they are struck with a heavy piece of wood, a deep, sonorous tone is produced. On the same principle, a number of long strips of hard stone, of different sizes, are hung on two tapes, forming a rude instrument called the "Rock Harmonicon," which, when struck with a soft hammer, produces very harmonious sounds. Clappers and hammers are generally too hard; vibration is required, not harsh collision.

Solid masses of metal, formed in a particular shape and suspended in a certain way—when struck with a hammer, will give very melodious sounds. For example, suppose a perfectly sound lump of soft steel be forged in the shape of a spindle, or of two cones of the same diameter, but of unequal heights, and united at their bases,—each cone bearing a relative proportion to the other, either in its cubical contents or superficial area,—the larger one to be three, four, or five times the size of the smaller,—suspend this at the largest diameter, or nodal part, by two pins or trunnions, and strike it with a hammer near the centre of gravity of the whole mass,—it will vibrate freely, and give a long-continued musical sound. Or take two pieces of metal, formed precisely of the same shape and dimensions as the last, one of soft steel, the other of bell-metal, and suspend them in a similar manner,—if these two be struck at the same instant, either with a hammer, or against each other,—care being taken that the striking point is near the centre of gravity of each,—the sound will be a loud, musical chord, of a very harmonious kind.

Different experiments lead to the inference, that coarse-grained, crystalline substances are not so sonorous and fit for the transmission of loud musical sounds, as those which are of a closer and more compact texture. Glass is extremely sonorous, and the sweetest tones may be produced from it. For this reason it is probable, that if, instead of fusing and casting them, bells could be manufactured by hammering the metal into the requisite form, the same intensity of sound might be obtained from a much smaller quantity of it. Of course the manual labour of beating a ton of metal into the required shape would be very considerable; but if one ton of beaten metal could be made to answer the purpose of four tons, melted and cast in a mould, there would be a saving of at least £300. in the cost of the material, which sum would be more than sufficient to pay for the hammering; and a bell so formed could not easily be cracked, nor would the tower be so heavily laden. The well known Chinese gong is, generally, an instrument remarkable for its rudeness of manufacture and thinness of hammered metal, but when struck with a soft hammer, it gives a deep bass tone, louder than can be obtained by any other means from the same quantity of metal.

I am prepared to hear it stated, that some of the sounds to which you have been listening may be very satisfactory on a small scale, and suitable for the interior of moderate sized buildings; but for high towers in cities, or open countries, such contrivances would be almost useless, being scarcely audible at the distance of 50 or 100 yards. I have my doubts as to the correctness of these objections, especially to such as have not been fairly verified by experiments on a large scale, and thereby proved to be failures. The sound of some musical instruments, the harp, for instance, is not over-powerful in a good sized room, and not louder than a pianoforte, or violin, when in concert; yet, during a quiet evening, or early in the morning, its melody may be distinctly heard at a much greater distance, and long after other instruments have ceased to be audible. The same remarks are applicable to the beat of a common military drum, which is distinctly heard at an immense distance. Two pieces of metal, of a sonorous kind, one, probably, only half the weight of the other, but of the same form and proportions, will give the same, or very nearly the same sound. I show the experiment, which is a curious fact, though I am not prepared to explain it. Taking this latter and many other circumstances into consideration, it must be evident that the entire subject should be thoroughly investigated; especially at the present time, when we have a grand building at Westminster nearly completed, with a clock-tower waiting for its bells, one of which is to weigh 14 or 15 tons, and the prime cost of the metal only for this one bell cannot be estimated at less than £1,700. When I hear of a work of this kind progressing in the middle of the nineteenth century without any improvement on the old system, I feel that the credit and character of scientific men is involved in the transaction. For, if they would turn their attention to the subject, it is not only possible, but extremely probable, that some plan might be discovered to answer the purpose of these ponderous bells, with perhaps half, or one-third of the quantity of metal, much less risk and difficulty of ringing, much less weight in the tower, and much more credit to all parties concerned in the great work.

In conclusion, I beg to make the remark, that a long habit of considering an established practice as not wrong, gives it a superficial appearance of being right. I am therefore afraid that popular prejudice, in favour of the old system of bell-founding, would be such a formidable barrier against improvement, that no innovation would be tolerated, except by almost imperceptible gradations. As far as the subject of this evening is concerned, it matters not whether large bells are the legitimate offspring of the Christian Church, or whether they are a remnant of Paganism. It is certain that they have been used in various parts of the world during the period of at least 500 years, perhaps double that time, with scarcely any alteration in their shape or composition. So tenaciously has the form been adhered to, that a common observer might imagine it to be heresy to think of making an alteration: it would almost seem that the shape and process of manufacture might be considered of too sacred a nature to be departed from, after having been practised for a thousand years.

Were I to present a peal of six or eight large spindles, or double cones, such as I have described, to be suspended in the bell tower of the new Church at Hanwell, I might expect to be sent after them to the neighbouring Asylum, for supposing that the churchwardens or bell-ringers were clever enough to ring the congregation to church with what might be mistaken for the clappers only. But surely, in these days of invention, when we live, as it were, in an atmosphere of steam-power,—when our words are sent, almost as quick as we can utter them, to the further end of a wire hundreds of miles in length,—when the portraits of living creatures, topographical views, or other complicated objects, can be produced in an instant by a flash of light, with such truthfulness and minute accuracy as to defy microscopic criticism,—it cannot be too presumptive to expect that, after a lapse of many hundred years, with the help of philosophic investigation, and mechanical science, we should be able to suggest some modification between the old ponderous bell and the thin, loud-sounding gong,—between the sweet notes produced by a musical snuff-box and the spindle-shaped steel which I have exhibited this evening. I will therefore conclude with the hope that some hints may be taken from my remarks, and that the discussion, which I trust will now follow, may lead to such experimental investigation as may ultimately change the present inconvenient, dangerous, and expensive system of Bell-ringing.

Mr. C. Barry, Fellow, said that the thanks of the meeting were due to Mr. Smith for bringing forward not only the subject of the casting of bells, but also points which were useful to them as architects; and especially the question of the degree of strength necessary for bell towers. If, as Mr. Smith stated, the mode of ringing bells was different now from that formerly practised, and if this mode were to be persisted in, it became a matter of importance to regulate the construction of bell towers accordingly. The comparative merits of cast and wrought metal for bells opened a wide field for interesting investigation. The peculiar sound of the gong was very remarkable, but it appeared to him that it had much less penetrating power than that of a large bell. It was, however, very difficult to arrive at conclusions on such a point, as the effect upon the ear of different individuals would vary. Thus, when Mr. Smith in some of his illustrations had assumed that there was no difference between certain sounds which he had produced, he (Mr. Barry) had thought there was a considerable difference. He hoped the subject would elicit much valuable information from gentlemen present who were peculiarly qualified to impart it.

Mr. Cornelius Varley, Visitor, said the subject of bells divided itself into two parts; one, how to obtain a good bell and the fullest sound with the least weight of metal; and the other, how to support the bells and obtain the most of their sound with the least injury to the building; this was the architectural part. With respect to swinging of bells, Mr. Smith was right; whilst swung in open space there was no increase of sound, but it varied as the mouth was swung to or from the auditor. This opened the architectural question, for whilst the bell hnng quiet it presented its best sound to the rough floor of the belfry, and spread it round into the corners, all serving as dampers, and a portion rushed out of the openings, where it was again cut up by the weather boards. A bell so smothered by the enclosure need to be much heavier, because we obtained but a portion of its sound; but if the bell was swung (though there was no increase of sound), it alternately presented its mouth to the two opposite openings, at which moments a larger portion of its sound was thrown out, and the discordant effect of its enclosure lessened, and thus by swinging we only lost less of the sound; but this swinging was communicated to the tower, and were it not for the discordant proportions of all the parts, a spire would be seen to vibrate, and all the parts trembled. The late Mr. W. Hardy contrived an inverted pendulum to show whether chronometer supports were firm enough; and it shewed that many swung right and left with the pendulum, and so prevented any very accurate adjustment. Bells being so much heavier than pendulums will rock their tower, and Mr. Hardy's instrument could be adopted to show it, and probably would prove it to be more than any important building ought to be subjected to. An architect, having produced a handsome building to endure the roughest weather, ought not to be required to spoil its proportions by any increased bulk to make way for and support a hidden agent, whose action was so inimical to durability. If bells were hung in the open air, over the conical roof of a tower or support suitably constructed for such moving weight, the cone below would spread their sound right and left; and if their cover were a large sounding board, we should obtain the most effect from a given weight of metal. With regard to sound and smooth bells, he had witnessed the full effect on the occasion of Lord Macartney's embassy to China, near the end of the last century; when two splendid musical snuff boxes were taken as presents to the Emperor; they played five tunes each, and opening the lid started one tune. It being desirable to obtain the utmost perfection, the musical part, and the tuning and fitting the bells, were entrusted to his late uncle, Mr. Samuel Varley; and though the bells were smoothly cast, in that state they were like bells in dampers when compared with the musical sound from the truly turned and polished bells. The inside being made quite true to the outside caused the entire co-operation of the whole bell to produce the sound. In cast bells, there was not only the rough surface, but inequality of thickness, a cause of discord inimical to the sound, and lessening its duration. This, in large bells, was very difficult to avoid, and in thick castings, the two surfaces cooling first, often left a division within, a still greater cause of bad sound. To illustrate this Mr. Varley exhibited a sectional drawing of a casting in brass for an air pump plate, ten inches diameter; finding it unsound (by the trial of ringing), he forced air in so violently as to separate the two surfaces three-eighths of an inch, and on cutting a piece out, found the division was eight inches diameter; this defect occured so often in ordinary castings that he suspected bells could not always be free from it. A very peculiar effect was produced by the bell of Cripplegate Church, when striking the hour of twelve; the first two or three strokes being distinct and clear, but the discord becoming accumulated with every stroke, at the eleventh and twelfth a complete double sound was produced. The difficulty of ensuring sound metal in bell casting was very great, as it was generally sound on the outside only, but crystalline within. In his own experience, he had found that metal cast in a hot mould cooled with a crystalline interior. Lord Rosse, by casting on a cold face, had succeeded in getting a sound mass all through. This question, however, concerned the bell founder rather than the architect.

Mr. C. Barry, begged to inquire of Mr. Warner, who was present, whether there was any mechanical difficulty in the way of counteracting, by some kind of equipoise, the effect of moving violently so large a mass of material as a church bell. This method was applied to some of the heavy machinery in the Cornish engines with success. Of course, the effect upon the masonry of a bell tower by the mere vibration of sound, was a different thing, and the amount of dislocation so produced was inevitable.

Mr. Warner said, there was no mechanical difficulty in the adoption of a mode of equipoise, which was indeed frequently done with small bells; but it would interfere with the ringing of changes. [Mr. Barry inquired how ?—Mr. Warner could hardly explain]. Small bells were rung without a wheel, the rope being fastened to a lever projecting from the stock.

Mr. Fowler, Fellow, asked Mr. Smith whether he had noticed, in towers which had sustained injury, the manner in which the framework of the bells was supported. This was a serious consideration for architects, and a point on which he had heard various opinions expressed.

Mr. Smith, referred to Mr. Ferrey's letter on that point, and to the mischief caused by ignorant churchwardens and others, who, in many cases, had got rid of the shaking of the wooden framework of the bells by driving wedges between the wood work and the masonry, to the consequent injury of the towers.

The Rev. W. Taylor, Visitor, referred to his statement last year, that the great bell at York had never been rung up to set. That statement had been contradicted by Messrs. Mears, who wrote, that it had been completely raised and fairly *rung* by sixteen men. He (Mr. Taylor), had however, sent to York for an official report on the subject, and the report was, that the bell had never been rung up to set. He was himself at York in October last, and found that, in fact, although thirty-six men had tried it, the bell had never been set; indeed with the present hanging it never would be. At York, there was ample strength in the tower for any bell to swing, whatever might be its weight. At Erfurt, the tower was very thin, but there the bell, which weighed 275 centner,* was rung up to *set* by twenty-eight men. That bell was not cut into the stock as at York; the latter method took from the centrifugal force, and made it impossible to get up the bell. The bell at Erfurt was 5 ells in height, and 15 ells in circumference, the ell being $2\frac{2}{10}$ feet English, and it was cast in 1497. The different sounds of different metals was an interesting question, and on that point he would remind the meeting, that at St. Nicholas, Hamburgh, very large tuning forks of cast-iron were struck instead of bells. Mr. Smith had shewn that a common mason's chisel would produce a pleasing tone, and that the note of two such chisels was the same, although one was only half the weight of the other. How then was a deep tone (such as that of St. Paul's bell) to be produced, if increasing the quantity of metal would not effect it? The note of the Erfurt bell was F, but he believed Mr. Denison expected to pitch the Westminster Palace bell in E. The continuance of the sound, and the power to be heard at a great distance, were the principal tests of a good bell; and the latter object would be promoted by hanging bells, as in Italy, on the outside of the tower, instead of enclosing them with louvre boards, &c. This point appeared to have been overlooked at the Palace of Westminster, where the outlet for the sound was exceedingly small as compared with the size of the bell.

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* Each centner = about 110 lbs.

MR. B. DENISON, Visitor, having been invited to state his views on the subject, expressed the interest he felt in it, as having been intrusted to give directions for casting the large bells for the Westminster clock. He considered himself, however, only a learner at present, and was anxious to gain all the information he could by this discussion. The subject would afford ample scope for another evening, and, whilst expressing his obligation to Mr. Smith for his remarks, he could not concur in the whole of his deductions. He should be glad to state how far he agreed with Mr. Smith, and how far and why he disagreed with him; but there would be hardly time for him to do so on the present occasion.

The further discussion was accordingly adjourned to January, 28th instant.

A DISCUSSION ON THE FORMS, METHODS OF CASTING, AND RINGING OF LARGE BELLS.

Resumed at the Ordinary General Meeting of the Royal Institute of British Architects, Jan. 28th, 1856.

The following letter was read from Mr. Chantrell, Fellow :—

"I do not see that any one has mentioned the bell at the 1851 Exhibition, which was light in weight and deep toned, the form being like that of the ordinary room clock, or pendule, a hemispheroid. The general form appears to be an equilateral triangle.* The bells of the Carillon at Bruges, said to be one of the finest in Europe, have the same form; they were cast in 1680; the greatest bell is about 10¼ tons in weight, in G, and is used to strike the hour; the half-hour bell is in C. There are four octaves, and modern pieces of music are played upon them every Wednesday, Saturday and Sunday, for the space of an hour. A large brass cylinder, 9 feet long and 7½ feet in diameter, is placed in a room below the bells, and four pieces of music are set by pegs (like the barrel of an organ) upon it, which chime every quarter of an hour. These bells are hung on wooden frames and struck by hammers outside, which are raised by wires and levers, moved by the brass barrel; they may be heard at some distance from the town. The tower is octagonal, and the eight large apertures or windows are open, so that the bells (being more than 200 feet above the ground) are seen and heard very clearly. There is a Carillon at the Church of the Dunes, attached to the Sèminaire, but being in a louvre boarded tower, it is only heard at a small distance. Some of the towers of the Churches have very small windows to the belfry, so that the bells, though large, have a very soft tone; they are tolled by having levers balanced over their heads, with stays and rails to hold by, and several boys get upon them for the amusement of balancing; the tone is very fine of some of them, those of the Cathedral especially; the St. Eloi weighed 11000 lbs., St. Sauveur 8910 lbs., one 6700 lbs., and the smallest 3500 lbs. In the Parish Church at Leeds, the belfry windows were filled in with stone tracery, part of which was taken out, because the bells could not be heard to windward; the idea was to substitute louvre boards, and while the advocates for these ornaments were straining their ears to catch the sound to windward, numbers were flocking to the town, having heard them on the first day of their being rung from the villages six or seven miles off. The bells of the chimes of Bruges have been exposed nearly two centuries, and those of Antwerp nearly the same time; they have a greater number of bells in this fine town, but they are not so distinctly heard as those of Bruges, though they are at about the same elevation. At Courtrai the Carillon is very fine, and the tunes are very distinct. All these belfries are open, and the bells are fixed; the church towers are more closed by louvre boarding and the bells swung, which appear to give a fullness to the sound, though not so loud. They are generally considerably larger than the English towers and have less oscillation. There are very many towers of our churches in an unsafe state, where I have pointed out the danger of continuing to ring the bells in our English fashion. Though change ringing may be very beautiful, I think most persons will, with me, prefer the chimes if they only once hear them on the Continent. I would observe, that the bases or mouths of the bells are all above the openings, or rather the cills, so that from below they can be seen entirely. I have had bells raised up with good effect in towers where they had been improperly placed below the cills. I find large stone corbels to support the floors in all good old towers both in England and abroad."

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* The base being the extreme width across the mouth, and the apex the highest point of the crown.

Mr. E. B. Denison, Q.C., Visitor, spoke to the following effect:—Mr. Smith said the other night that his object was to open the door to a discussion on this subject of bells, rather than to express any particular views of his own. It would have suited me better if the discussion had been postponed, until I had some more definite results to communicate to you from the experiments which we are now making with reference to the bells for the great Westminster clock. But as the discussion has been raised and specially adjourned to this evening for the purpose of your hearing from me such information as I have to communicate, I will proceed to do so without further preface and as rapidly as I can, inasmuch as the title of Mr. Smith's paper really embraces a great number of distinct questions. We have to consider the shape of bells and their composition, the mode of casting, the effects of ringing in full swing compared with striking them while fixed, and its effects upon the tower, the mode of hanging, the construction of the bell frame, and of the bell-chamber to hold it, and finally the destruction of bells by the common fate of cracking, and the methods which have been suggested for preventing it. The leading topic of Mr. Smith's lecture was the suggestion of some other form for a bell instead of the heavy and expensive article in common use. Now in this, as in most other things, it would save people a great deal of trouble if they would form a clear idea of what they want before they set to work to make inventions for effecting it. If you want a musical sound produced by percussion, several instruments were exhibited the other night, and I shall show you some more to-night, which will undoubtedly give a grander effect under certain circumstances than a bell of the same weight and of the same form. Here is the common contrivance, for instance, of a clock striking on a long steel wire coiled up, so as to produce a tone deeper than the heaviest cathedral bell, but not too loud for a room. And on the other hand, if you want a loud noise without much music in it, you can go and listen to the rivetting of boiler plates, or the shriek of a steam whistle. What a church bell or a public clock bell has to do, is to make a loud and distinct noise, with a definite beginning and immediately running off into a musical sound. Now listen to this gong, as I rouse it up to its proper roar: it makes what you think a very loud noise and also one of a musical character, and people say, look how light a gong is in comparison to a bell of the same note, and then they denounce the prejudices of mankind for not having long ago adopted or invented something in the gong form as a substitute for bells. But you probably do not know, that the gong, which sounds so loud in this room, besides not answering at once to the blow, as a bell must, especially a clock bell, is perfectly inaudible at half the distance at which a common dinner bell of no greater weight may be heard distinctly. The same is the case in a still greater degree with those deep sounding clock springs like the one I struck just now: compared with these, the common hemispherical clock bell is a powerful instrument, and gives a loud and pleasing sound at a distance where the springs are almost inaudible, and unpleasant so far as they are audible. Then there is another apparatus which was alluded to the other night as having had its capacity for sound overlooked in consequence of the old fashioned prejudice for bells; that is a circular plate, or a flat rod of metal suspended on two strings near its ends. Well, here it is, and I dare say you think the sound is very solemn and imposing compared with a bell of the same weight. But this, with many other experiments not worth exhibiting to-night, was tried by the late and the present Mr. Dent with a view to church clocks long ago; and you must be content with my telling you, as you have no means of judging of it in this room, that if you were to move off to the distance of about two rooms, you would hear this fine sounding plate as nothing better than an iron pot, while the bell would still sound clear and distinct, and more pleasing than it does here.

Mr. Taylor mentioned some gigantic tuning forks which were put up at St. Nicholas' Church at Hamburgh as a substitute for bells. I think they cannot be very successful, because Mr. Scott, who (as you all know) is building the church there, and of course knows the place well, is ignorant even of their existence; and Professor Wheatstone, who recommended them, cannot tell me anything of their success. If they had been recognised as an effective substitute for bells, Mr. Scott and Mr. Wheatstone would have been pretty sure to hear of it. And I am sure, from the nature of the thing, it will not do for that purpose, and approaches much too near to those musical clock springs which you heard just now, and which produce such a feeble sound at a distance, when the common small clock bell is heard very distinctly. But these hemispherical bells themselves, which are of the same thickness throughout, bear something of the same relation to the common church bell with a lip or *sound-bow* much thicker than its *waist*, that the musical springs bear to the spherical bell: that is to say, they give a much deeper note from the same weight of metal, but at the same time a much weaker one. Many of you will remember two bells of that shape, or near it, in the Hyde Park Exhibition; one of them was made of Mr. Morries Stirling's "union metal," and Mr. Dent's large clock was first put to strike upon it by Mr. Stirling's desire. The sound seemed very deep and grand when struck with a heavy piece of wood, and we concluded it would be very effective when struck with an equally heavy clock hammer. But we soon found that it was impotent at a distance, much less even than the length of the building; and so that bell was replaced with one of the common form, which afterwards accompanied the clock to its destination at the King's Cross Station. The other hemispherical bell there was still heavier, in fact, very nearly as heavy as that same second clock bell, or about 29 cwt. and made of the common bell metal. It had a very fine sound when you stood near it, deeper a great deal than the note of the 14-ton bell we are going to have at Westminster. But that also was of no use at all as an instrument for making a loud noise to be heard a long way off. This is an answer to the remarks in Mr. Chantrell's letter respecting these bells in the Exhibition.

It is noticed in some books, that if you strike one of these common spherical clock bells, and apply to it a tube of half the diameter of the bell, and a length equal to the diameter of the bell, with its mouth directed towards the edge of the bell, you will rouse up a great addition to the sound. Mr. Dent and I have tried that experiment with bells and tubes of various sizes, and we find, and you shall see, that the sound of the bell is enormously increased by the tubes; and that several tubes of different sizes will do for the same bell, producing different qualities of tone. [Mr. Denison showed the experiment, and the effect was very obvious.] Well then, you are inclined to say at once, here is a means of getting a vast body of sound out of a comparatively light bell with the addition of nothing more than a tin tube. But though the musical or after sound is thus increased, the noise of the actual blow is not materially increased by the tube—certainly not to anything like the loudness of this other bell [showing one] of the same weight and the common form. And here is another curious fact: we cannot find any tube which will produce any sensible effect towards increasing the sound of this common bell, although we had no difficulty in finding several different sizes of tubes which will suit the thin hemispherical bell. If I am to offer a guess at the reason of this, it is that the upper part of the common bell, which is nearly a tube in shape, does really act as the sounding tube to the vibrations of the bell when struck. I do not propound this explanation as much more than a guess; but it is rather confirmed by the fact that applying a second tube to a spherical bell after you have got one to suit, does not do much more than using only the single one, and the shape of this upper part of a bell undoubtedly affects the quality of its sound.

Then we come to Mr. Smith's double conical spindles. It is no doubt interesting to find that a musical sound can be got out of such apparently unpromising shapes of metal by striking them in a particular way. But just take one of these spindles into your hand, and feel the weight of it compared with this small dinner bell, and now listen to the sound of the two. I think even Mr. Smith will be satisfied that the world is not to be condemned for prejudice because we do not discard our bells, and content ourselves with hanging up the clappers alone and striking *them.* Here is one more experiment for saving a great part of the weight of a bell. My colleague in the matter of the Westminster bells, Mr. Taylor, has brought here a small bell with the greatest part of the waist cut away as you see; so that the bell now consists of little more than a widish ring hung by some strips of metal to the crown. The note is thereby made deeper, for an obvious reason which I shall notice hereafter; but I am perfectly satisfied that the bell is spoilt, though unfortunately I cannot satisfy you of it just now, because we have not a fellow to it here uncut.

Now from these and other experiments I have come to the conclusion that bells of the common and well-known shape, with a thick lip or sound-bow, are the most effective known instruments for producing a loud and musical sound, such as you want when you erect a large public clock, or put up a peal of church bells. And I confess also that after trying at Messrs. Warners' a number of experiments with bells of the usual *general* form, but with various deviations in the details, I am equally satisfied that there is nothing to be gained by deviating materially from the established proportions of the best old bells. And I think it is some confirmation of my views to tell you that Professor Wheatstone having been commissioned by the Board of Works, with Sir C. Barry, on his own suggestion, to collect information at the late Paris Exhibition "respecting the most esteemed chimes in France and Belgium, and whether there are in those countries makers acquainted with the traditions of the art, or who have applied the discoveries of science to the improvement of bells, *or to efficient substitutes for them,*" has come back with the conclusion that no such efficient substitutes have been discovered, nor is there any known improvement on the established mode and materials for casting them. Sir C. Barry and he indeed seem to have been rather impressed with the merits of the cast steel bells which you may have seen noticed in the newspapers. I have not heard them myself, but I have heard such decided condemnation of their harshness of sound from other persons of probably more experience in such matters, that I do not the least believe in their being received generally as an efficient (though they may be a cheap) substitute for the more expensive compound of copper and tin: and, on the whole, that seems to be Professor Wheatstone's opinion also.

But although I have thus satisfied myself that the common form and material of large church and clock bells, such as we want at Westminster, are substantially the right ones, there still remains a great deal to do to ascertain the more precise details of form and composition which will produce the best sound out of a given quantity of metal. And here I considered that we had to begin at the beginning, and it is hardly an exaggeration to say, that instead of presuming that anything is right because we now find it in use among the bell-founders, it is rather safer to presume that it is wrong. That there is something very far wrong somewhere in the modern style of casting bells, and especially large bells, is manifest from this—that everybody who has paid any attention to the subject, complains of the lamentable inferiority of modern bells to old ones, and even to bells made in the early part of this century. Let me quote again that same letter of Prof. Wheatstone's to the Board of Works, with reference to this subject:—"The very unsatisfactory result of the chimes constructed for the Royal Exchange, which have been twice re-cast, without any ultimate advantage, shews that no known bell-founder in England can be relied on." And then he makes the suggestion which I quoted just now. I know perfectly well that the makers of all these three unsuccessful peals of large bells (two of which were cast by Mr. Mears, and the third by Messrs. Taylor, of Loughborough), can produce volumes of testimonials to the excellence of their bells. But I have seen rather too much of testimonials to pay much regard to them, whether they relate to bells, clocks, or morals. To say nothing for the present about the two latter articles, I have heard people describe bells as "very fine," which

I would not buy at a penny a pound, except for the purpose of selling again at ninepence. As for the opinion of musicians, as such, I value it rather less than that of other people, because I have always found that the first and almost the only thing they look at, is whether a peal of bells are in tune with each other, the least important part of the business for two reasons; first, because if they are out of tune (unless very atrociously), they can be cut into tune; and secondly, because a set of iron saucepans could be made as perfectly in tune as the finest peal of bells. And with regard to single bells, where the question of tune does not arise, still, unless a man knows by experience what kind of sound a certain weight of bell metal ought to produce, it is impossible that his judgment can be worth anything on the merits of any particular bell. Most Oxford men believe their Great Tom is a very fine bell, just because it makes a loudish noise, and they have no idea, and cannot have any, whether it is either the quantity or quality of noise which ought to come out of a bell of 7½ tons. Whereas, I know that a *good* bell of half that weight would give a much louder and a much pleasanter sound, and that in fact, the bell is about as bad as possible. I mention that because it is not a modern one, having been cast in 1680; and because the *occasional* occurrence of bad old bells, and also of good modern ones, proves that the general badness of the modern ones, compared with the general goodness of the old ones, is not to be accounted for by the hypothesis that they improve by age; though it is true, that they generally do improve a little for a few years. Without saying that any of the modern large bells, such as those of York, Lincoln, and Montreal, are quite as bad as the Oxford bell, they are all very far short of what they ought to be, and very inferior to the *old* Tom of Lincoln, which was cast in 1610, and was considered the finest large bell in England, as I can easily believe from the density of the metal, of which I have a piece, and I shall say more about it presently.

It has been stated in substance by the founders of the two first condemned Exchange peals, that the second of them at any rate must have been good ones, because they (or most of them) were cast from the same *sweeps* or patterns as the celebrated Bow bells, which were cast by the predecessors of the same firm in the last century; and indeed they say the same of many others of the modern peals which people are stupid enough to pronounce very bad. I am rather inclined to think, that this identity of shape, together with the inferiority of sound which is manifest to everybody except the founders, proves something very different, viz., that they have forgotten the traditions of their own art and of their own house; and as the quality of bells cannot possibly depend on more than these three things—shape, metal, and casting, and they themselves tell us that the shape is the same, they leave us no other solution, except that they use bad metal, or have lost the art of casting it properly, or both. That some of the modern bells are unsoundly cast, I can say positively, because I have seen the metal full of holes, which are sometimes visible on the surface, but sometimes, and I suspect more frequently, invisible until the bell is broken. The larger a bell is, the more likely this is to happen, as it is well known that thick castings are harder to make sound than thin ones; and that is an obvious explanation of the fact, that the large bells of modern times are even worse than the small ones. Now it luckily happens, that we have a ready means of discovering whether a bell is both soundly cast and of good metal, by simply taking its specific gravity for the soundness, and analysing a piece of it for the purity. You may file off enough from any bell to enable a chemist to analyse it, and see whether it contains any baser (*i. e.* cheaper) metals than copper and tin. And we know what the specific gravity ought to be: the old Lincoln bell was 8·78, and the old Doncaster bells (of 1722, not 1835, for some of the latter I know were unsound) were 8·76: the French authorities on the subject, I find, put it as high as 8·82, and from actual experiment. It is remarkable, that there is scarcely any difference between the specific gravity of the alloy, whether it contains the largest or the smallest proportions of tin to copper that are ever used; because, though the tin is much lighter, it makes a denser compound with the copper until it reaches the proportion of speculum metal, about 1 to 2; whereas, bell metal never has more tin than 1 to 3, and the modern bell metal not so much as 1 to 4, because it is only put in in those proportions, and some of the tin always wastes in melting. The rule for getting the specific gravity is so simple that I may as well give it. Suppose the weight of the bell is A, then weigh it in water (taking care that it is both filled and submerged), and call that weight W; then the specific gravity $= \frac{A}{A-W}$; which ought to be 8·75 at least. With regard to the best proportions of tin and copper I am not able yet to state any certain conclusions. The fact, however is, that the old Lincoln bell contained rather less than ·75 of copper, and the rest was tin ·20, and antimony, and a very small quantity (no doubt accidental) of nickel, with what the chemists call mere traces of some other metals. There was, some years ago, a fashion of putting antimony into speculum metal, but it seems now to be thought better to fill its place with tin. No antimony is found in the old Doncaster bell metal, nor I understand, in that of the old York bells, in which the proportion is 1 of tin to 3 of copper, as in the Lincoln bell it is about 1 of tin and antimony together to 3 of copper. I find also in a French book on alloys, three authorities for 1 of tin to $3\frac{1}{2}$ of copper, others for 1 to 3, but only one for 1 to 4. I will just caution you against confounding 1 *to* 4 with 1 *in* 4. Remember, that if the tin comes out on analysis one-fourth of the whole, or ·25, it means that the tin is not one-fourth, but one-third of the copper. I mention this, because I have constantly found people confound the two things in other matters besides bell founding. The bell founders do not like this *high* metal, as it is called, because it is harder to cut if the bells require tuning; but they have no business to want tuning, and never do when they are cast of the proper thickness for their size. If the high metal is the best, that is a singularly bad reason for not using it. So far as I have yet been able to judge from experiments, I am of opinion that it is the best, for the more the tin is reduced below the point where it would make the metal too brittle, the less time the bell appears to hold the sound when it is struck. Lord Rosse adopted a multiple of what are called the atomic or equivalent proportions of tin and copper in his great speculum, which are 59 and 32 very nearly; and from some facts which Mr. Dent has told me about different compositions for chronometer springs, and other experiments, there seems reason to believe that there is some advantage in keeping to the chemical equivalents. At any rate it can do no harm, and you will find that 4 of tin to 13 of copper, does give very nearly the ratio of 59 to 6×32, and it certainly produces a very hard, and elastic, and strong bell metal, very like the Lincoln bell in appearance.

I have not time to enter into the details of casting, nor is there any occasion for it. I have told you how you may ascertain whether any given bell is made of sound bell metal; and if the bell-founders are made to understand generally, as Messrs. Warner do with regard to the Westminster bells, that their bells will be rejected if they are not made of sound bell metal of proper density, they will take very good care that they are. I will however just mention that Lord Rosse's method of getting a sound speculum, by casting it on a cold bottom, would not do for bell-founding; for you will see at once, that a thing of the shape of a bell cannot cool in layers like a flat speculum of uniform thickness. What we want, is a method of keeping the metal in the upper part or waist of the bell hot and fluid as long as possible, so that it may keep falling down into the sound bow or thick part as the metal cools there. Moreover, copper and its alloys of tin have this remarkable property, that the slower they are cooled, the harder and denser they are. A bell metal bullet cast in a cold mould and thrown into water as soon as it is solid, is quite soft and stringy inside, though very smooth outside, compared with one cast in a hot mould and cooled as slowly as possible; indeed they are so different, that you would suppose the latter had twice as much tin in it as the former if you did not know their history. Mr. Varley tells me, that some copper cylinders for printing were cast of even greater density than hammered copper, by forcing the metal down into the runner or "git" with a piston heavily weighted. Messrs. Warner's plan of casting bells from iron cores and copes, coated only with the loam, seems to offer great facilites for this forcible mode of densification.

But there is another cause of the inferiority of modern peals of bells, which is still more easy to judge of and to get rid of, if you choose. It was noticed in a short paper on bells in the Ecclesiologist, vol. XIV, that less metal is now used to produce a given note than in the old bells. Of course, if the result was equally good, that would be a great proof of the skill of the modern bell-founders. But unfortunately, the result is very bad. I do not think, however, that they are so much to blame for it as the public, who in this, as in everything else connected with building, are always demanding grand effects out of insufficient means. At the same time, as the bell-founders seem rather disposed to humour than to correct the public ignorance on this point, I will try at any rate to make you understand this fallacy. First of all then remember, that any musical note can be got out of any weight of metal. You may get a note an octave or two deeper than the E flat, which I expect our great Westminster bell to be, out of 14 ounces just as well as 14 tons of bell metal, if you only make it thin enough. And on the other hand, we could have that 14 tons of metal cast into a bell with a note one or two octaves higher, if we only made it small and thick enough. In the former case you know, we should have a bell that would be scarcely heard at the distance of ten yards instead of ten miles; and in the latter, the mass would be too thick to be put into musical vibration at all, and it would give very litte more than the mere sharp noise of a blow. Somewhere between these limits necessarily lies the thickness and shape of a bell which will give the best sound for its weight; if you make the bell larger and thinner than that best form (whatever it is), you lose in power and quality of tone, though you increase the depth of note; and if you make it smaller and thicker you raise the note, and when you get beyond a narrow limit you lose in power too, because the bell becomes too thick to be made to vibrate throughout. Now, I am quite satisfied, and I believe it is generally acknowledged, that the most effective proportions for a bell are where the thickness of the waist is about $\frac{1}{36}$th, and that of the sound bow about $\frac{1}{12}$th of the diameter. And these proportions will, of course, give one definite and ascertained note, and no other, for any bell of given weight and shape. The tenor at Bow for instance, is C, and weighs 53 cwt. But Messrs. Taylor have made the tenor of their new peal at the Exchange, of the same note, with only 33 cwt; and in some other peals which I have seen, they have deviated still further from the old proportions, for they carry this system even further than the other bell founders. Again, it is a law of mathematical certainty, that if you make eight bells of any metal and any shape, provided only they are all of the same metal and proportions (*i. e.* the thickness varied in proportion to the diameter), and of dimensions in this ratio—30, 32, 36, 40, 45, 48, 60, they will give the notes of the common diatonic scale, and in fact, be a peal of bells in perfect tune with each other. Moreover, their weights will vary as the cubes of the diameters, or the tenor be eight times as heavy as the treble. But in practice it is found expedient to make the two or three smallest bells, especially the treble, rather thicker and heavier in proportion, and within moderate limits there is no objection to it. For instance, in the grand old peal of Exeter Cathedral, the tenor is 67 cwt., and the third of the ten is rather more than one-seventh instead of one-eighth of that weight. But in modern peals, you will be lucky if you get a tenor of eight bells more than four times as heavy as the treble, or the tenor of six more than double of the treble, though it ought to be nearly four times as much, even allowing for a little increase of thickness of the treble. Now, when you have not only inferior casting, but this system of spoiling all the large bells of a peal by thinning them besides, you need not be surprised at the universal complaints of the badness of modern bells. The remedy for this is simple enough: stipulate that no bell in the peal is to be thinner in the sound-bow than $\frac{1}{13}$th of the diameter, and this defect will disappear at once; only in that case people must give up making the absurd demand upon the bell-founders to give them a peal of bells in E for the money which will only buy copper and tin enough for a peal in G. When the specification was issued for the Westminster bells, one of the bell-founders wrote to ask what note Mr. Denison intended the great bell to be: I answered that Mr. Denison intended the bell to be of such note as it might turn out to be when made of the proper size and thickness to produce a good bell of 14 tons. *I expect* that note will be E flat, but I cannot say positively that it will be lower than E, because I have not yet quite determined the exact proportions which seem to be the best, by casting experimental bells of a quarter of the size, or $\frac{1}{64}$th of the weight, and consequently just two octaves higher. The third quarter bell will be the octave above the great bell, and therefore half the size and one-eighth of the weight. You will find the order and construction of the chimes, and of the clock itself in the Treatise on Clocks, which I wrote for the last edition of the Encyclopædia Britannica, and which was separately published by Black, of Edinburgh, last year.

This is a convenient place for giving a list of the largest bells in the world, according to the best information I can get from various sources :—

	Weight.		Diameter.		Thickness.	Note.
	Tons.	Cwt.	Feet.	Inches.	Inches.	
The great bell of Moscow, broken in 1737	193		21		23	
Bell at the Kremlin, fell in 1855	63		...		...	
Pekin	53		...		...	
Novogorod	31		...		...	
Vienna, 1711	17	14	9	10		
Sens	15	0	8	7		
Westminster, 1856	14		9	2	9	E flat
Erfurt, 1497	13	15	8	$7\frac{1}{2}$	...	F
Notre Dame, Paris, Louis XIV.	12	16	8	7	$7\frac{1}{2}$	F probably
Montreal, 1847	12	15	8	7	$8\frac{1}{4}$	F
Cologne	11	3	...		...	
York, 1845	10	15	8	4	8	F sharp
Bruges	10	5	...		...	G
St. Peter's, Rome	8		...		...	
Oxford, 1680	7	12	7	1	$6\frac{1}{8}$	
Antwerp	7	3	...		...	
Exeter, 1675, very thick in the waist	5	11	6	4	5	A ?
Lincoln, 1834	5	8	6	$10\frac{1}{2}$	6	A
St. Paul's, 1709	5	4	6	$9\frac{1}{2}$	...	
Ghent	4	18	...		...	
Boulogne, modern	4	18	...		...	
Old Lincoln, 1610	4	8	6	$3\frac{1}{2}$	...	B
Fourth quarter bell Westminster, 1856	4	0	6	$1\frac{1}{3}$	6	B flat

You observe that the diameter of the Erfurt bell, which is said to be the finest in the world, is less than Mr. Taylor's figures. As both his authority and mine agree about the weight, and this size is given me by a very accurate person who measured it himself, and it is more consistent with the weight than the much larger size printed last week (the bell being a very thick one), I have little doubt that this is correct. Others give also several greater sizes and weights for the Notre Dame bell, but these are the figures lately obtained by Mr. Donaldson from M. Viollet le Duc, the architect superintending the works at Notre Dame now, and he has sent a drawing of the actual figure, or sweep of the bell on a large scale; so that this also seems to me the most likely to be correct. I must add that the clapper is stated to be of the enormous weight of 23 cwt., or $\frac{1}{11}$th of the weight of the bell, which is about four times as much as I have ever seen suggested for the clapper of a ringing bell, though I lately had one put to a tolling bell of twice the usual weight, with very good effect. But M. Viollet le Duc has fortunately sent the dimensions of the clapper also; and it is clear from them, that the weight which has been given to him is fabulous, and at least three times too much. Even 7 cwt. would make it twice the weight of the clappers of the York and Montreal bells. I suspect ours are generally too small, and I am certain that when the bells can only be tolled by reason of the weakness of the tower, much larger clappers might be well and safely used, provided the bells are really tolled, and not the clappers pulled against them with a force which depends entirely on the discretion of the man who does it. When the bell is too heavy to be tolled in the common way, the clapper ought to have a separate pulley, not at the side, but in front of the middle of the bell, and so placed that the ringer cannot hold the clapper against the bell. I believe more bells have been cracked by the slovenly practice of tolling by the rope tied to the clapper, than by all other things together, besides its twisting the clapper itself on one side, and deranging it for ringing. This is only one of the many points in which the saving of shillings often entails the waste of pounds, and sometimes hundreds of pounds, as at Doncaster in 1835, where the whole peal was recast at a cost of £300, because the two largest bells had been cracked through mismanagement.

It did not appear to me that Mr. Smith made out a very good case against the swinging of bells. Indeed, as Mr. Barry said the other night, his own experiments were enough to satisfy us at that end of the room (if we had doubted it before) that swinging a bell, or a gong either, does increase the sound considerably. The notion of ringing bells in full swing being modern and contrary to the intention of those who built our church towers, seems to me to have no shadow of evidence to support it. Peal-ringing it is true is said not to have come in till the sixteenth century; but even that is a good while ago, as we are now in the middle of the nineteenth; and all the old bell frames that I have seen, which are generally made much stronger than the modern ones, show by their form that the bells were intended to swing, at any rate, as high as the horizontal position. The mere vibration of a tower while the bells are ringing, is no proof that it is in danger; for stone, like everything else, is to a certain extent elastic. Bells of course may be too large, or hung too high in a tower to be rung safely, and then they must be stopped and only tolled, or hung lower down; but there are plenty of towers which have been vibrating every time the bells are rung for centuries, without being any the worse for it as far as we can see from any symptoms in the building. Nevertheless, as I am addressing a good many architects, I take the liberty of telling them that I lately received a letter from an old member of a London bell-ringing society, who appears to be well acquainted with all the peals in London and the neighbourhood, making the remark that there have only been two church towers built in the last 30 years which are really fit for a good sized peal of bells, viz. St. Giles's, Camberwell, and St. John's, Hackney. I can answer for it myself that the vast majority of modern towers are totally unfit for a peal of eight bells, which ought to have a square of 18 feet inside the tower at least; and even that allows nothing for a clear space all round the bell-frame, as there ought to be. When the tower is small, even if bells of the proper size for a peal of eight (of which the tenor ought never to be less than a ton) can be got in, they are too close to the walls, and those in the corners cannot get their sound out of the windows, which moreover are nine times out of ten too small. Too large they cannot be for this purpose; and they ought to be as little as possible filled up with louvres. A few broad stone louvres not much overlapped, and wire netting to keep the birds out, are better and look better than anything else; and the windows and bells ought to be so placed that the mouth of the bells is neither below the windows when tolling, nor above them when ringing. A bell of 1 cwt. in an open bell gable is sometimes heard farther than a bell of 20 cwt. in a close bell chamber. I am glad to say that Sir C. Barry has now arranged a perfectly open place, which you may see half way up the spire or roof, for the great Westminster clock bell to stand in, instead of being within the roof as originally contemplated.

If persons who have only raised £250 or £300 for bells, would spend it on a couple of large ones instead of five or six small ones, it would be a great deal better. The ringing of two large bells together has a fine effect; and some day or other they might become the tenor and 7th of a good peal of six or eight. It is surprising to me how some of the richest parishes in London submit to the clanging of one or three bad small bells, when it would cost so little to replace them with good ones. That of St. George's, Hanover-square, sounds as if it were made of cast iron.

I must say a few words on the subject of bell hanging. I noticed last year the common and mistaken notion of the bell founders' carpenters, that by hanging bells at right angles to each other they will counteract each other in swinging. I now give a sketch of eight bells hung as they have been in Fredericton Cathedral and are intended to be in Doncaster Church, all swinging north and south (in which direction the tower is strongest), but in opposite directions, and the frame well tied together by diagonal braces at the bottom, so that it must all move or stand together. This horizontal diagonal bracing has generally been altogether neglected, and consequently you see one part of the frame moving one way, and another another, and trying to tear itself to pieces and damage all the hanging of the bells. The fallacy of hanging large bells high in the stock has been sufficiently exposed by Mr. Taylor. It has arisen from the ignorant and absurd idea that a bell is *lifted* up, like a stone by a lever, instead of being *swung* up by centrifugal force, like a stone in a sling, and kept swinging just as the pendulum of this great clock is, by nothing stronger than a musical box spring, wound up every half minute, which of course could not lift a pendulum of 6 cwt. the millionth part of an inch. And as for the high hanging making the large bells swing faster, and nearer the time of the small ones, it does just the contrary; because the lowering of the point of suspension in a large mass does not necessarily accelerate its vibration at all; and the great increase of friction from hanging the bell on the grindstone system, or as near the centre of gravity as they can get, certainly makes it slower, and more difficult to swing up, and to set when it is up, and also certain to rise false, or with the clapper on the wrong side.

To follow the subject to its end, I must not overlook the disease of which bells generally die, that is, cracking after the clapper has worn them thin in one place. I see Mr. Baker's model of his patent plan for turning a bell in the stock again upon the table. I will not repeat what I said of it last year. But as I am certain it will never be generally adopted, I beg to offer you another (without a patent) which you may remember I suggested in this room when I first saw the other, and have now had executed. You will understand the plan in a moment from this drawing. It is nothing but a thick round neck to the bell instead of a crown, with a flanch round the top, which is embraced by six bolts coming through the stock. The clapper-bolt runs square through the stock, but round through the top of the bell, and has nothing to do with carrying the weight of the bell (exactly the opposite of Mr. Baker's plan). When the bell is worn in one place, you have only to loosen the bolts a little, and then a few of the ringers standing round the bell will easily twist it round a little way for the clapper to act in a fresh place. If this is done once in 10 or 20 years, according to the work of the bell, it may just as well last 1000 years as 100, and this mode of hanging evidently need cost not a penny more than the common plan.

I must apologise for the unusual time I have been talking on this subject. I did not introduce it; but having been specially invited to give you my views upon it, and no practical information that I know of having been yet published upon it in England, I have endeavoured to say something that may be of use on all the topics included in the title of Mr. Smith's paper.

The Chairman, Mr. PENROSE, V.P., observed that there would not be time to continue the discussion, and the members must decide whether it should be resumed on another evening.

Mr. SMITH, Hon. Mem., expressed his extreme gratification at having been the means of eliciting so much valuable information from Mr. Denison; and an unanimous vote of thanks to Mr. Denison having been passed, an adjournment of the discussion was agreed to.

A DISCUSSION ON THE SUBJECT OF BELLS,

Resumed at the Ordinary General Meeting of the Royal Institute of British Architects, Feb. 11th, 1856.

Mr. W. L. Baker, C.E., Visitor, having requested permission, proceeded to read some remarks:—

Large bells of a shallow basin shape are now used in some cemeteries, and are found to give a deep note but weak in power; they thus possess the advantage of not being heard at a distance. But it is from the ogival bell, that the loudest, clearest, and best quality of sound may be obtained; we therefore find this shape almost universally adopted in the bells of our church and clock towers. The best modifications of this general form, the precise curves of the sweep, the various thicknesses, and the nature and treatment of the alloy to be used, must be determined by the practical experience of the bell-founder, who, no doubt, may be assisted by scientific research and careful experiment. It is therefore to be hoped that the details and results of all experiments and calculations connected with the bells for the clock tower of the Palace of Westminster will be published.

It has been proposed to cast bells without external beads or inscriptions; but I cannot think this omission of any importance, as the beads seldom project more than one-sixteenth of an inch, nor the lettering more than one thirty-second. It is much more important to get the inside of the bell perfectly concentric with the outside. The inscriptions, generally giving the date when the bells were cast, are often interesting and instructive. Much has been said and written lately about the superiority of old bells over modern ones: the results of my experience do not entirely coincide with such statements, some of which are perhaps partly due to a natural tendency to find excellence only in the productions of former times. There are many old bells belonging to peals in country places, that have a diameter of mouth equal to sixteen and a half times the thickness of the sound bow, and their sound is consequently weak and panny. The tuning of old bells was often very imperfect, probably on account of the great expence attending the process, which was done entirely by hand with hammer and chisel. At the present day the tuning is effected with much greater accuracy and much less expence by a revolving cutter driven by steam power; but still there is no doubt that modern bells are in many instances anything but what they ought to be; and I have lately discovered in examining a new peal of bells, what appear to me very startling anomalies both in their shape and thickness. We have also heard high praise of Foreign bells. I have heard bells in France, Portugal and Brazil, and my impression is, that on an average French and Brazilian are inferior to the bells of this country. There are, however, some excellent bells in the Cathedral at Lisbon. I saw last summer the great bell the "Bourdon" of N. Dame, at Paris; the diameter of its mouth is eight feet six inches and three-quarters, and the thickness of sound-bow is eight inches; it weighs about fourteen tons, and the indentations made by the clapper are $1\frac{1}{8}$ inch deep.

The effect of ringing is very different from that of merely striking bells while stationary, or, as it is technically called, chiming them. In ringing, a bell is made to perform a series of oscillations, and is struck once at each oscillation; it thus throws off the sound in a great number of directions owing to the arc it describes, and may be said to cause the air to vibrate in a series of rings expanding in an infinite variety of non-parallel planes, which intersect one another, and cause that pleasing undulatory vibration in the air so peculiar to ringing, and which cannot be obtained by chiming, or in any other manner.

A suggestion has been made during this discussion by Mr. Varley, to hang bells above the ridges of tower roofs. Bells may be seen hung in this way in France, and under suitable circumstances, the same plan might be adopted in this country. The bells of the churches at Rio de Janeiro are all hung in the tower windows, and some of them are of considerable size, one bell always taking up the entire width of a window. I have never observed more than four bells in the same tower. They are hung upon immense ornamental wooden stocks, the gudgeons of which run in bearings let into the granite sides of the windows, so that no frame is required. The stocks have one, and in the case of heavy bells, two levers attached to them, projecting inwards at an angle of about 30 or 40° above the horizontal line; short ropes are attached to the levers, and the blacks who are employed to ring the bells stand on a floor in the tower, placed on a level with the bottom of the bell windows, and with the simple tackle I have described, manage to raise very heavy bells and to set them without stays and catches. Bells thus hung in tower windows are very picturesque objects, and probably there would be no objection to a few irregular sized bells being thus placed. But it is quite out of the question to think of hanging peals of bells in this way, because the different positions of the bells in reference to the surrounding neighbourhood, causing some to quite overpower others, would seriously interfere with the beauties of change ringing, and there would be many objections to hanging them all in windows on one side of a tower.

Some towers, from their positions and proportions, are no doubt better calculated to do justice to bells than others. The clock tower of the Palace of Westminster stands boldly out from the surrounding buildings and rises to a considerable height above them. I have heard with astonishing distinctness, in the neighbourhood, the noise of the hammers and chisels of the workmen engaged in the erection of its iron roof. The fine position determined upon for the large hour bell resembles that suggested by Mr. Varley of a bell hung above a conical roof with a sounding board over it.

Mr. Smith has particularly alluded in his paper to the injury occasioned to towers by the lateral strains to which they are subjected by the ringing of the bells, and Mr. Ferrey has stated that he has had "frequently to deplore the serious injuries caused to the towers by the action of the bells." My own experience is more limited, but I have been in many ringing rooms and bell chambers during the ringing of peals, and have often placed my back against the wall so as to become more completely sensible of the nature of the oscillations of the tower. These have invariably appeared to be of an elastic character, and it is evident that in a well built tower, oscillations not exceeding the limit of elasticity of the material of which it is constructed cannot injure it or interfere with its stability. The floor of the ringing room of St. Martin's in the Fields is about on a level with the top of the balustrade over the cornice of the Church, and even at that level the tower oscillates very considerably during the ringing of a peal, but good workmanship and the elasticity of the materials have prevented its peal of twelve, weighing about 147 cwt., doing it any injury; in fact, the tower is as sound now as ever. Another feature peculiar to the movement of a tower during the ringing of a peal is, that the consecutive arrangement of the bells in certain changes will cause it to oscillate very considerably, while during the ringing of other changes no oscillation will be perceived. Church towers are much better built now than they were twenty or thirty years ago both in regard to their size and stability, but the internal arrangements of the bell chamber and ringing room are often, in many respects, inconvenient. In some, built within the last ten years, the ringing rooms are the chambers immediately under the bell lofts. They are consequently so noisy and confusing to the ringers that it is next to impossible to ring complete peals in them. A double ceiling would in some measure remedy the evil, but an intermediate chamber between the bell loft and the ringing room would be still better.

Bell frames should be made as perfectly rigid as possible, and all tendency to twist provided against. If laid on a stout floor, they would be stiffened by being well secured to it, especially if the flooring boards were laid diagonally. The floor should be well spiked to the girders. The plan, described by Mr. Ashpitel last year, of laying the frames, floor, and girders without fixing them to one another, would not reduce the thrust on the tower, and would allow them to work about in a very objectionable manner, causing great additional labour in ringing the bells. The more rigid the frame, the easier the bells travel. Iron frames, therefore, properly constructed, are better than wooden ones, with the advantage also of greater durability. My model on the table shows a cast iron frame for a single bell of large size; a horizontal diagonal brace introduced below the bell counteracts any tendency to twist. This brace is raised from below and bolted in its position after the bell has been hauled up into its place. Bells are more conveniently accessible when the frames are not laid on the floor, but the latter is fixed 4 ft. 6 in. or 5 ft. below the lowest parts of the framing; this arrangement gives access under the bells to the clappers, and allows the loft to be freed from rubbish, great quantities of which are sometimes brought in by birds, but should not be allowed to accumulate and rot on the floors or between the bell frames.

In France the louvre windows of bell towers are frequently of gigantic proportions, the bells being suspended in an immense wooden frame of vertical, horizontal, and diagonal timbers, built up from the bottom to the top of the windows, like an internal and independent tower. The 14 ton bell at Paris, to which I have already alluded, and three smaller bells are hung in a frame of this kind, the louvres being attached to the bell framing. Although the extreme angle described by the centre line of the 14 ton bell, when ringing, is only equal to about 90°, the frame oscillates considerably with it, north and south, and even when the oscillations of the bell become very small after it has ceased to sound, the lateral movement of the frame and louvres may be seen from the street below. Any movement in a bell frame is objectionable, and shows that it is not equal to its work. Peal ringing is unknown in Paris, and the bells (of which I believe there are not more than from one to four in each church) are universally rung by the feet of the ringers standing above the bells, by means of treadle levers bolted at right angles to the sides of the stock near its ends. With the present arrangements, eight men only can conveniently be engaged at the same time in thus ringing the 14 ton bell at Notre Dame.* The operation appeared to me awkward and attended with some danger to the ringers.

It was stated in the previous discussion that when the crown is let up into the stock, a bell will be raised with more difficulty than when it is attached to a stock which is straight on the underside; and that the greater the centrifugal force developed by the swinging of any bell, the more easily will it be raised. Now in raising a bell, a man imparts as much force as he is conveniently able to supply, and as long as the force continues to be greater than that required to overcome the resistance of the air and the friction of the gudgeons, and thereby to maintain the oscillations of the bell in any given arc, the remaining force causes the bell to describe a greater arc at each oscillation, till ultimately it is completely raised. The time of oscillation and the angular velocity of any given bell will be about the same, whether the crown is let into the stock or is attached to a straight stock; the actual velocity of the mouth will therefore be greater in the latter case, the bell will meet with more resistance from the air, and will consequently require more power to raise it; the centrifugal force will also be greater than in the former case, and the friction of the gudgeons will be increased, occasioning still further exertions on the part of the ringer. With a straight stock, the whole work to be done is greater, as the centre of gravity of the moving mass has to be raised through a greater distance, and the same amount of power being applied, more time will be required to raise it. The following advantages, then, are obtained by letting the crown of a large bell into the stock,—it is raised with not only less effort on the part of the ringer, but also in less time; there is less strain on the stock and the bolt or bolts connecting the bell with the stock; there is a less lateral thrust on the tower, and lastly, the framing in which it hangs not only requires less strength, but may be made more compact, and consequently less expensive. With respect to the clapper going up on the wrong side when the bell is raised, I do not conceive that that practically influences the raising of the bell one way or the other. There is scarcely a tenor bell in London, the clapper of which does not go up on the wrong side, the only practical disadvantage being, that a man has to go up and turn it on the right side, after which the bell will clapper just as well as if it had been raised with the clapper on the right side.

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* Mr. Papworth, Fellow, has communicated the following particulars of bells in Germany:—Olmutz, 358 centners (about 17 tons 18 cwt.); Erfurt, Maria Gloriosa, 1497, 275 cent$^{r.}$ (about 13 tons 15 cwt.); Cologne, 1448, 224 cent$^{r.}$ (about 11 tons 4 cwt.); Breslau, 1507, St. Elizabeth's Church, 220 cent$^{r.}$ (about 11 tons); Gorlitz, SS. Peter and Paul Church, 217 cent$^{r.}$ (about 10 tons 17 cwt.); Halberstadt, the Dominica, 1457, 150 cent$^{r.}$ (7 tons 10 cwt.); Dantzic, St. Maria Church, 1453, $121\frac{1}{2}$ cent$^{r.}$ (about 6 tons $1\frac{1}{2}$ cwt.)

The following facts will clearly show the advantage of letting the crown of the bell into the stock:

The bells of Bow Church, Cheapside, after twelve years' silence were re-hung in the year 1835, and the crown of the tenor bell was let up further into the stock. Since the alteration, that bell weighing 53 cwt. has been rung by one man for four hours and five minutes in a peal of 6000 changes, whereas before the alteration it had never been rung single handed in any peal.

The 42 cwt. tenor of St. Michael's, Cornhill, could never be rung single-handed till the year 1840, when its crown was let further up into the stock, and since that alteration it has been always rung in peals by one man.

At St. Giles', Cripplegate, we find a peal of twelve bells, the tenor being 36 cwt. In the year 1843, they were re-hung, and the crowns of the larger bells were let up further into the stocks. In the year 1851, a peal was rung in this tower consisting of 7524 changes, in five hours and twenty-four minutes, during the whole of which time Mr. John Austin, then between fifty and sixty years of age, rang the tenor bell unassisted.

The ordinary wooden slider, alluded to in the discussion on bells last year, is a bar of wood lying across the bottom of the cage in a horizontal direction; it is fixed at one end, and is generally made curved in order to clear the skirt of the bell and the ball of the clapper, and at the same time to get the other end close up under the mouth of the bell within the range of the stay, the length of which is limited by the framing. The slider must therefore generally be a piece of carpentry, and not a mere stick. This kind of slider is replaced in my plan of hanging bells by a vertical iron catch, which is not only simple and strong, but occasions much less friction than a horizontal slider.

I do not participate in the fears expressed by some gentlemen that one bolt would not stand the strains of a heavy bell in a state of oscillation; whatever the strains may be, it is evidently quite possible to make the bolt strong enough to resist them, and the sufficiency of a single bolt is still more obvious in the case of bells that are to remain stationary, like those intended for the clock tower of the Palace of Westminster. Hung in this manner, such bells could be frequently and easily turned round their vertical axes, and the wear occasioned by their enormous clappers and hammers spread round their sound bows. If the 14 ton Westminster bell is hung in the manner shown on the drawing now exhibited by Mr. Denison,* it will be a much more difficult matter to turn it about its vertical axis than is perhaps at all contemplated. It is ridiculous to suppose that such a bell can be slewed simply by the hands of a few men. In order to accomplish this operation, a quantity of tackle, screw jacks, and in all probability, planks and staging will be necessary; and taking into account the time and labour requisite to hoist these to the top of a very high tower, to move the bell, and then to remove and lower the tools, tackle, &c., we shall find the operation, under the most favourable circumstances, attended with very considerable expence. It would be much better to slew a bell once every six months than once in ten years as has been proposed, and a 14 ton bell might be fitted with a permanent apparatus for doing this, without interfering with or stopping the striking of the clock, for much less money than it would take to move the bell once without it.

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* See illustration given with the last Paper.

It was mentioned by Mr. Ashpitel in the discussion last year, that "he had observed at Rome that the clapper was hung so as to have some play round the sound-bow, and not to strike always on the same point." I have observed the same thing myself in foreign bells, but it would not do for the clappers of a peal of bells to have any lateral motion, because they would not then clapper with any degree of accuracy. I have recently been very positively informed that in breaking up old bells for re-casting, it is frequently discovered that they have been cracked in the crown by the oxidation of the piece of iron cast in them, from which the clapper is suspended. A bell cast on my plan would never thus become cracked.

Mr. R. C. Nichols, Visitor, read a paper containing some investigations into the nature and amount of the dynamical forces arising during the motion of a large bell, and proceeded to explain certain formulæ which he had obtained for the direct strain upon the bolt or bolts supporting a bell in motion; the vertical thrust and horizontal strain upon the gudgeons; the transverse strain upon the bolt or bolts supporting a bell during the motion; and the greatest amount of strain on any part of a cylindrical section of the top of the bell measuring the tendency to tear out the boss.

In a previous discussion the direct strain upon the bolt or bolts supporting a bell in motion was stated to be six times the weight of the bell, but it would be found that in actual cases the greatest direct strain rarely, if ever, exceeds four times the weight. With respect to the vertical thrust and horizontal strain upon the gudgeons, the latter is of importance, as the measure of the force tending to pull the framing to pieces and to cause oscillations of the tower.

The amount and direction of the horizontal strain undergo remarkable fluctuations during the motion of the bell. It is at first a thrust which becomes a maximum at an angle with the vertical of 26° 44′—diminishes to nothing at 48° 11′; increases again to its greatest value at 124° 3′, and again becomes nothing at the lowest position; passing through a series of values equal and opposite to these as the bell ascends on the opposite side. The equation for the horizontal strain indicates one advantage obtained by letting the bell into the stock, namely, the diminishing of the horizontal strain; the importance of which fact will be appreciated by architects.

The transverse strain upon the bolt or bolts supporting a bell during the motion is for a bell hung on Mr. Baker's principle, and perhaps in most cases, of even greater importance than the direct strain. It is at its maximum value in the horizontal position of the bell.

The effect upon the bell tending to produce fracture is a combination of the effect of the direct and transverse strains. The measure of that tendency is the strain per superficial inch on that part of the section of the bolt which is subjected to the highest tension. The greatest amount of strain on any part of a cylindrical section of the top of the bell, measuring the tendency to tear out the boss, is represented by a similar equation.

These formulæ being applied to the case of a bell of 2 tons weight, represented by Mr. Baker's model, the maximum direct strain on the bolt supporting the bell is found to be 12,231 lbs. or 5 tons $9\frac{1}{4}$ cwt., or less than three times the weight of the bell; the maximum horizontal strain on the gudgeons 5497 lbs. or about 2 tons 9 cwt. The moment of the transverse strain at the top of the boss is equal to that of a weight of 1439 lbs. acting through the centre of gravity of the bell, and is therefore somewhat less than one-third of the effect which would be produced by the weight of the bell if sustained in a horizontal position by means of a force applied to the wheel or stock. The greatest strain per superficial inch which would arise in any part of the section of the bolt during the motion of the bell would be, with a 4 inch bolt, 7486 lbs., nearly 3 tons 7 cwt., about one-eighth of the breaking strength of wrought iron. The maximum strain, per superficial inch, on any part of any section of the top of the bell, the thickness of the top being 1¾ inch, the diameter of the boss 9 inches, is 548 lbs.

The breaking strain of bell-metal being taken at above 10 tons per inch of section, there can be little danger of tearing out the boss.

In the 5 cwt. bell exhibited at Paris by Mr. Baker, the weight of the bell and clapper is about 567 lbs., and the greatest direct strain on the bolt 2126 lbs., nearly 3¾ times the weight, the maximum horizontal strain on the gudgeons 1162 lbs. The transverse strain is little more than one-eighth of that which would arise if the bell were forcibly retained in a horizontal position by a pressure applied to the wheel or stock. The maximum strain per superficial inch, arising on any part of the section of the bolt immediately above the boss, is 1821 lbs. or about 17¼ cwt. The maximum strain on any part of the crown of the bell is 346 lbs. The small amount of transverse strain, in this case, compared with the other, arises partly from the comparative lightness of the stock and wheel (about one-eighth of the weight of the bell, while in the former case their weight was nearly one-fourth), and partly from the bell being less sunk into the stock.

Without applying the formula to more cases, it may be considered sufficiently evident that bells may be hung with perfect security in the manner recommended by Mr. Baker. Whatever may be the strain upon the bolt, its dimensions may be proportioned accordingly, so as to give it any required strength, and it should be observed that its power of resisting the transverse strain, which is the most important one, increases with the cube of the diameter.

Bells, however, which are not intended to be swung require much slighter support, the strain being limited to the dead weight of the bell. If this were not the case, the proposed mode of hanging the great bell at Westminster would be very objectionable. It appears that it is intended to rest with a flange on a number of hooks made at the ends of bolts. Now, every one is aware that a bent rod of wrought iron will straighten with a strain many times less than that sufficient to rupture it. Still, provided these hooks be sufficiently numerous and strongly made and I do not suppose that the bell would be actually unsafe. Although Mr. Denison has not expressed a very flattering opinion of Mr. Baker's system of bell-hanging, he has paid Mr. Baker the highest compliment by adopting the essential principle of his invention. With a view to remedy the evils resulting from the clapper constantly striking the bell in the same point, Mr. Baker proposed to hang bells upon an axis, in such a manner that they might be readily turned round so as to present in succession to the blows of the clapper every part of the sound-bow. He recommended that this should be done by hanging the bell upon a single central bolt, certainly the simplest and best mode of effecting the object, but in the specification of his patent, he also claims the hanging of a bell upon an "axis cast on to the top of the crown." This is the mode adopted by Mr. Denison. The details of his plan, of which Mr. Denison's is by no means an improvement, are not described in Mr. Baker's specification, but the general principle of suspending a bell upon a circular projection or axis in such a manner that the bell may be turned round, is most distinctly claimed.

Mr. Ashpitel, Fellow, said that his system of fixing the bell-cage in the tower had not been correctly described by Mr. Baker. In the first place he fixed strong stone corbels in the walls of the tower; upon these the main girders, keeping the ends two inches clear of the wall, to allow them sufficient play. On them he placed the framed floor, and upon the boards of the latter he directed the bell-hanger to lay the bell-frame or cage, with loose bolts dropped through it into the timbers below, to keep the whole from surging. He entirely concurred in the remarks of Mr. Denison. Bells should be considered first, as single bells—secondly, as forming part of a peal or chorus, or a double quartett when there were eight in a peal—and thirdly, as carillons or chimes. Mr. Denison had truly observed, that the old fashioned form for a bell had never been surpassed, provided it was of a reasonable size, and the waist had a sufficient sweep. The flower-pot shape, or anything approaching it was bad, and produced what might be described a growling tone. The bell of St. Peter's, Rome, too nearly approached that form. The gong, under certain conditions, was musical, but beyond a certain point the sound became discordant and dissonant, the rattling vibrations counteracting each other. Mr. Denison had stated, that in the present day with a view of saving metal, the lower bells were made too light and too deep in tone; but he (Mr. Ashpitel) would suggest whether, by calculating these matters too strictly, they might not be likely to get peals in which the upper bells would be too weak, and the lower bells too noisy and bawling. A peal of bells should be regulated on the same principle as the instruments in an orchestra. In the orchestra of the Philharmonic Society, there were eight double basses to thirty-two violins, and if there were as many of the former as the latter, the sound would be " all bottom." In the case of carillons or chimes the upper notes must predominate, just as the accompaniment is subdued at a concert to allow the air to be heard clearly. The Royal Exchange bells had this defect, the upper bells, which should give the air, could not be clearly heard. Messrs. Mears had stated to him (Mr. Ashpitel), that the Royal Exchange bells were as good as any ever cast, having been made according to the traditions of the trade for centuries; but they stated when a subdued bass note was required to fill up the harmony, it was found that the same force of blow was given by the machinery upon the lower bells as upon the upper ones. As nearly as he had been able to follow Nr. Nichols' explanation of his formulæ, he thought that gentleman had forgotten the effect of the centrifugal force in ringing bells.

Mr. Nichols explained that he had duly allowed for the centrifugal force.

Mr. Ashpitel had observed so, but not as he could see with regard to the torsion on the suspending bolt, caused by the centrifugal force; in other words, he was afraid that bells hung on Mr. Baker's plan would be severely tried by the rending force upon the swing. In the old fashioned way of hanging it by canons, the bell was grasped in a number of places; and it seemed almost impossible that any centrifugal force could rend it. Mr. Denison's method of hanging bells appeared well adapted for such as were fixed, but not for those which required to be swung. The *pitch* of the sound of a bell, whether A, B, C, or D, &c. in the gamut, depended on the *number* of vibrations in a second. In Euler's time that of the lowest CC on the violoncello was 118—since he wrote, concert pitch has been raised, and the number of vibrations producing the CC are increased. The next question is the *quality* of sound, or whether a rough noise or a musical sound is produced; this depends on the *equality* of the vibrations in point of time; in other terms, whether the vibrations were isochronous, and this results from the solidity of the material. A bell containing a flaw, or a violin string a little frayed, will not give regular vibrations, nor a pleasant tone. Another condition was the *loudness or softness* of the tones, and this depended on the *intensity* of the vibration—the harder the bell was struck, or the further a string was pulled back. The note in point of pitch would be the same, A, B, or C, and the *force* of the vibrations would cause the forte and piano.

Mr. G. Foggo, Visitor, referred to Rèaumur's experiment shewing that sound can be produced by a hemispherical mass of lead cast in a ladle. Mr. Smith's remarks on the amount of sound given by solid bodies as compared with hollow forms were very interesting, and it was satisfactory to know that Mr. Denison's mind was open to conviction.

Mr. Ferrey, V.P., gave some explanation of his remarks on the injury sustained by towers from bell ringing. Many towers, no doubt, had been so badly built that the effect from that cause had become very serious. The tower of St. Mary's, Taunton, for example, had a mere rubble wall with thin ashlar, and the building had consequently suffered materially and was now in danger. But in other buildings the same defects had arisen from the negligence of those who had charge of the bells. If, however, the bell-framing was properly adjusted, if the bells had free and proper action, and were properly placed together, no injury whatever would accrue to a well constructed building. In the case of Bell Broughton church, two bells were added to a peal a few years ago; the framing for these was placed upon the original one; and instead of making them act independently of the walls, timbers were introduced strutting across from side to side of the base of the spire; the oscillation of the bells very soon caused an abrasion of the ends of the timbers, which became in fact so many battering rams acting upon the masonry; and moving in different directions they so shook the whole fabric, that it was necessary to take down and rebuild the upper part of the spire. Some churches in Surrey contained interesting bell-cages, built from the floor of the church upon stone cushions and not connected with the masonry. He saw no reason why the present mode of hanging bells should be changed, but it was necessary that they should be properly looked after and not left in the charge of ignorant and careless men.

In answer to an inquiry whether a continuous corbelling to carry the belfry floor was preferable to single corbels,

Mr. Ashpitel described the modes of corbelling which he considered best under different circumstances. The main point was to avoid that impinging on the sides of the tower so well described as the battering ram system. In the central tower of the Abbey Church of Pershore, a churchwarden, considering the fabric insecure, had the bell-frame wedged up to such an extent that the tower became cracked and shattered in all directions.

Mr. Denison, Q. C., Visitor, observed that the leaden hemisphere, referred to by Mr. Foggo was perfectly familiar to him. With reference to it and the mason's chisels, shown by Mr. Smith, the question was, whether more sound could be got from a solid mass, or from a hollow body containing the same weight of metal; and he had no doubt the result was in favour of the hollow form. He had not the smallest objection, as he had before stated, to any person adopting Mr. Baker's method of hanging bells, but after talking with many bell-founders and some bell-ringers, and after hearing the opinions expressed now, and in the discussion last year, he had pretty good reason to believe that that method would not be adopted. Mr. Baker or his friends had asserted that he (Mr. Denison) had adopted Mr. Baker's principle; and to prove it they quoted three lines of that gentleman's specification, viz.—" My invention consists in hanging such bell upon one bolt or axis." The drawings before the meeting would show that he had not adopted that method, as the central bolt in his (Mr. D's) plan was used only to sustain the clapper, and was so small that it could obviously have nothing to do with carrying the weight of the bell.—" For which purpose I fix a bolt through the crown of the bell, or cast the bell with a tail or projection, which I fix in the stock."— Neither of these methods, as the drawings proved, had he adopted. Therefore, if the question of piracy should arise, he advised Mr. Baker to save his money and keep clear of litigation. Mr. Denison then referred to the "setting up in the stock," and to the ringing of the bells at York and Erfurt, as mentioned at the last meeting. Mr. Baker, by a certain amount of calculation, endeavoured to prove that it was easier to raise a bell when it was set up in a stock; but the question was, whether by doing so certain conditions of friction were not introduced, which would interfere with the raising, and more than counterbalance what was gained in the way of counterpoise. He never knew any case of friction that could be determined otherwise than by experiment. Mr. Airey, the Astronomer Royal, had calculated the friction in the wheels of some clock-work, but the result proved that he was deceived, as he (Mr. Denison) had predicted. Now he did not take any credit to himself for being able to calculate the friction better than Mr. Airey, but in all these matters there was a sort of instinct, or rule of thumb, the result of experience, which was better than any amount of calculation. Mr. Baker gave instances of bells in London which were improved by being re-hung and set up in the stock; but the result might have been due to something else. He had mentioned a bell of 36 cwt. which one man had rung for four hours, whereas it took three men before;—but why should a bell of that weight ever have required three men to ring it. The very fact that it did so, proved that the case was worth nothing. Mr. Baker had not correctly represented what he had said about "sliders." He had in fact stated that they might be bits of sticks and he said so because, when he began bell ringing, he found that he broke a great many stays, and he soon came to the conclusion that, by breaking sliders instead of stays, he should save money, and therefore, in fact, the sliders were made of sticks, and they were more easily manageable and lighter, as well as cheaper. The sliders were light bits of stick instead of heavy ones. With reference to the Westminster bell, he admitted that it would be more easily turned by Mr. Baker's plan than by his own, but the question was whether it was worth while to adopt Mr. Baker's. He would not argue that question, but would simply state that those whom he had consulted thought it was not. He did not himself care about it, if Sir B. Hall liked to incur the expense. Certainly he had never yet seen a bell worn out by a clock hammer, nor even worn to the depth of half an inch, though many had been worn out by the clappers. And moreover, clock bells would not require turning in four times the time that it would be necessary to turn a bell rung with a clapper. The Oxford bell was a good deal worn by the clapper inside, but not to the extent of half an inch by the clock hammer. Whether from the flatness of the hammer or the steadiness of the blow, he did not pretend to say, but such was the fact.

Mr. Varley, Visitor, alluded to the mode in which gongs were hammered alternately on both sides into a state of extreme tension, and to the peculiar snapping and crackling sound given by those instruments when struck. It would be impossible to make a musical peal of gongs, or to tune them so as to get a series of notes or musical tones. Mr. Varley also mentioned the noise produced by letting fall a flat tea tray. With regard to Bow Church, he mentioned that on going up the tower with Mr. Gwilt, he observed two of the pillars of the peristyle were broken, and that bell-metal bands were put to hold them together. He wished to know whether these columns were cracked by the vibration of the bells, and whether it was not consequently dangerous to ring them.

Mr. Ashpitel, with reference to the noise produced by a tea-tray, alluded to the "thunder" at theatres, made by shaking a long sheet of metal. The object however in bell-founding was not merely to produce a noise, but that noise which could travel furthest.

The Chairman (Mr. Tite, V.P.) explained that the fracture of the columns in the tower of Bow Church had arisen from the introduction of iron plugs in the joints, which had oxydated and burst the stones. To remedy this, the broken shafts had been bound round with bands of gun metal; but as there was a heavy dome resting on these columns, Mr. Gwilt had afterwards taken them away and replaced them by granite shafts in one piece. He knew no reason why the bells should not be rung. There was an impression that it would be dangerous, but he believed it was erroneous. He had himself been on St. Dunstan's in the East, above the arches, when the bells were ringing, and had felt the whole place vibrate, but the bells had been rung ever since the Fire of London without substantial injury, although he had several times repaired the arches from accidents arising from the same cause as at Bow Church, namely, the oxidation of the iron plugs.

Mr. Fowler, Fellow, suggested that the use of copper instead of iron bolts would not be attended with the same evil.

A Visitor observed that the theory of producing various degrees of pitch of sound from bars, plates, and other forms of metal had been well known for ages. The theory of the subject was also perfectly correct with reference to the loudness of the sound being dependent on the extent and number of the vibrations in a metal bar or a string; but with respect to the *quality* or *timbre* of the sound, that was not so well understood, either in plates, bars or bells. The *volume* of sound as distinct from *loudness* was not at all clearly explained, nor the property which enabled sound to travel quickly and to a great distance. The sound of a bell was certainly louder when it was waved; but only when the bell was moved *towards* the hearer, and not during the reflex action.

The Chairman regretted he was not present at the former meetings, as he felt much interest in the subject, having been blamed for the failure of the Royal Exchange bells, over which he had no control. He agreed with the last speaker as to the importance of *timbre* or quality of tone. At the Royal Exchange they had never succeeded in getting the bells in tune. There was a certain scale of notes which were intended to play tunes, and therefore should have been properly pitched. There was no particular necessity to study expence, and he had been anxious to get a good chime of bells. At Messrs. Mears's works, he found a rude system in operation, which appeared inconsistent with anything likely to ensure tune. He saw indeed that the whole matter was traditional; and he therefore suggested that bells so roughly cast could hardly be in tune; and he further proposed to put the series in a row, and by striking ascertain whether the gamut could be produced. This trial, however, was declined. The machinery for the chimes was made by Mr. Dent, one of the most skilful mechanicians in the world; but as soon as they began to play, the effect was highly disagreeable. In fact the peal was not in tune. Then came a series of suggestions, such as "the hammer strikes too hard," but as Mr. Dent said, it was easy to make it strike softer, by merely shortening the lever. The architect and the tower were in fault, indeed, it was anything but the bells; but in fact the tower contained a large square chamber, with four large windows filled with louvres, &c. He even offered to take the louvres away. At last it was agreed to take down the bells and re-cast them of a larger size, and with two additional bells; but the new bells failed. It was plain that the makers had no rule; yet they produced testimonials without number, and engaged that the bells should be in tune to the satisfaction of Mr. Edward Taylor, Gresham Professor. At first they insisted that the bells were in tune, but Mr. Taylor tested them with a violin to show that there could be no possible mistake. The bells were chipped, cut and altered in every way without success, and he (the Chairman) never could get people to believe that *tone* was not *tune*. Mr. Taylor, of Loughborough, re-cast the bells, but without success, and he believed the chimes remained a failure. He had found in an old manuscript an illumination showing a man grinding bells, and he believed that the ancients in fact turned the inside of their bells in an accurate form with regard to the outside, according to some rule now lost. He believed that the same law or mathematical process by which he had seen Erard set out the top of a harp, might be applied to a bell, so as to conduce to its accurate tuning in any particular note. He had heard the traditional story that the founder of the tenor bell of Bow Church never left it, but was always filing or hammering the inside till he got it to the proper note or pitch of the C of that time. The Chairman further observed that a letter had appeared in the *Times* stating that the Westminster bell could not be got into the clock tower, as Sir Charles Barry had forgotten to provide an access for it. It was due to Sir Charles Barry to state that this was not correct. He had not forgotten the matter, nor was there any difficulty in it; neither would it cost £3000. to erect a scaffold to raise the bell. The meeting was aware that the whole of one side of the lower story of the clock tower, facing West, consisted of a large arch, which had been filled up with brickwork; the bell would be brought up to the arch, and so much of the brickwork removed as might be necessary, and the bell would then be raised without any difficulty whatever.

The Chairman then adverted to and explained some of his remarks made at the opening of the session. The meeting afterwards adjourned.

SOME REMARKS MADE AT THE ORDINARY GENERAL MEETING OF THE ROYAL INSTITUTE OF BRITISH ARCHITECTS, February 11, 1856.

Mr. Tite, V.P., having closed the discussion on the subject of Bells, proceeded to say—As I have had the honour of occupying the chair to-night for the first time for many weeks, I am anxious to take the opportunity of putting myself right with reference to some remarks which I made in the discussion on the diploma question, on the undue preference (in my opinion) given to Mediæval Architecture, and which remarks have been somewhat misunderstood. I was an early cultivator of Mediæval architecture; I esteem it very highly, and I think I understand it; but all that I wanted to urge was that it was not reasonable to abandon the better styles of architecture (for many purposes) for what I considered the fashion of the day. That the study of classical architecture is neglected is proved by the fact that there have been no competitors for the architectural medals of the Royal Academy, as stated by the Professor in a recent lecture—now why is that? Surely because the young architects of the day are studying Mediæval Church architecture to the abandonment of other studies, and I presume, therefore, until the Academy can be induced to give a medal for a design in that style we shall have the same result. Such a state of things I greatly regret, because classical architecture gives us the best and most certain principles of feeling and thought in architecture. With regard to Mediæval architecture, it is true we have become good copyists, but our fore-fathers did vastly more than this, for they urged on their thoughts and inventions—they went on from excellence to excellence, and they often obtained it in the search after novelty. Young architects should study the principles of things, and apply them to expression, utility, and fitness in architecture. In the remarks to which I have referred, I found fault with the unfitness of modern Mediæval churches for the purposes for which they were built. I quoted one which, although elegant and beautiful, was anything but a Protestant church. I stated, amongst other things, that on the south side of the deep chancel of that church, there was a range of sedilia. Now of what Protestant use could they be? The rubric says the minister shall "stand on the north side of the altar,"—and even among Roman Catholics they are obsolete. Such ornaments are not only useless but expensive, and inconsistent with the purposes to which the churches are applied. Then again I have seen lately in two large squares near Belgrave-square, large masses of building in which classical architecture would have given a better church than those which have been built there. I allude to Warwick-square and Chester-square, composed of masses of regular Italian buildings; and forming one side of each square irregular Gothic churches with spires are placed, which appear to me incongruous and out of place; and inside they are not adapted to those vast congregations which frequent them. That these are the opinions of men as well able to judge as myself, is proved by the remarks of Mr. Petit, the learned Ecclesiologist. He says,*—"There are good reasons why we should rather make the best of our old churches, than materially alter them or destroy them to build others in their room: the impression they are calculated to produce more than compensates for some inconvenience in their form or arrangement; but there seems no reason why we should ever plan or build a new church of an inconvenient form, or in any way unsuited to our own manner of worship. If, for instance, it is desirable that all the congregation should be within sight and hearing of the minister, why should a church ever be built in which a part of the congregation is hidden from him when he performs any part of the service in the usual place? And this must be the case in every church having aisles which terminate at the division between the nave and chancel. If we find that galleries are useful and convenient, why should we build churches that will not bear galleries, or to which they are a disfigurement? If we professedly adopt high-pitched roofs as suitable to our climate, why should we ever combine them in such a manner as to leave a lodgment for snow or rain? There may be difference of opinion as to the advantage of an unbroken area, or the expediency of galleries; still they serve my purpose in illustrating the proposition I would advance, which is, that an architect ought not to abandon a convenient arrangement on account of its ugliness, but rather try to get rid of the ugliness without giving up the convenience. If, then, a feeling that his first object is to make his building fully answer its primary purpose, and a determination that nothing shall be allowed to interfere with this object, be referable to a spirit of utilitarianism, I conceive that so far, at least, an architect ought to be a utilitarian."

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* *Vide* Builder, January 26, 1856—Mr. Petit's Address at the Architectural Exhibition

That is the opinion of a modern Ecclesiologist of great learning and judgment; but I will quote also the opinion of Sir C. Wren. He was called upon to build the City churches, and he gives this opinion on the subject.* He says—"Churchwardens may be careless in speedily repairing drips, but they will usually whitewash the church and set up their names, but neglect to preserve the roof over their heads." He next proceeds to discuss the capacity and dimensions of the proposed new churches, and a mode of calculation to determine them from the number of inhabitants for whom these churches were to be built, which he calculated at four hundred thousand, or five times as many as were burnt out in the City. The churches, therefore, he says, must necessarily be large, and if they were built to hold two thousand persons each, the accommodation would fall very short of the requisites, but, he adds, in our reformed religion it would seem vain to make a parish church larger than that all who are present can both hear and see the preacher. The Romanists indeed may build larger churches—it is enough if they hear the murmur of the mass and the elevation of the host, but ours should be fitted for auditories. He considered it to be hardly practicable to make a single room so capacious, with pews and galleries, as to hold above two thousand persons, and all to hear the service, and both to hear distinctly and see the preacher. He endeavoured to effect these objects, he says, in building the parish church of St. James, Westminster, which he presumed was the most capacious, with these qualifications, that had then been built; and yet at a solemn time when the church was much crowded, he could not discern from a gallery that two thousand persons were present.

I was rather more urged to express the opinion I did, by not desiring to see classical architecture neglected merely in obedience to a present fashion. I believe that fashion will to a certain extent pass; I may be mistaken, but it appears to me that the universal application of Mediæval architecture and forms is an error and a great mistake. I simply suggest that as my opinion, and I regret that that which formed so important and so necessary a subject of study in my early life should be at the present day neglected for something which, though beautiful in its way, has not so many claims upon our attention, and is not so well adapted to our forms of religious worship. I have no desire whatever in the least to interfere with the views of others, but those who choose to adopt those views conscientiously will find in me a man to think for myself. I am glad to have this public opportunity of saying a word upon this matter, because by one of our most eminent professors of architecture I have been a little misunderstood. I only offer this as a matter of explanation and not of discussion at the present moment.

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* *Vide* Elmes' Life of Wren, and the Parentalia.

A REPLY TO SOME REMARKS MADE AT THE ORDINARY GENERAL MEETING,
November 19, 1855.

To the Honorary Secretaries of the Royal Institute of British Architects.

My dear Sirs,—

I intended to be present at the meeting this evening (but was prevented by a slight indisposition) to offer some few words in reply to the remarks reported in your printed notice of the previous meeting, as having been made from the Chair, by our respected Vice President, Mr. Tite, on the subject of the revival of Pointed Architecture.

In a society which supposes each of its members to hold his own individual opinion, and to express them freely as he pleases, it may appear unnecessary to notice mere manifestation of feelings which every one knows our respected friend entertains; but coming *ex cathedrâ* from the Chair of our Institute, and from our parliamentary representative, they may, if unanswered, appear to acquire more weight than belongs to them, and be viewed not as the feelings of an individual member only, but as those of the Institute as a body; in which case it would naturally become the duty of those who hold contrary opinions to make a formal protest, or to separate themselves from the Society.

Mr. Tite contented himself in his address at the preceding meeting with a general expression of regret that the love of Pointed Architecture was becoming too exclusive, but with some compliments to its favourers on their success as compared with their fellow-labourers in France. He commences his second series of remarks with a somewhat stronger expression of his regret, especially that we do not keep ourselves to the buildings for which our style is suited; warming as he proceeds, he accuses us of being mere blind copyists, incapable of thinking for ourselves, and winds up by showing that our style is unfit for any purposes at all unless it be for Roman Catholic churches. Now, would it not have been better to have acknowledged this opinion at the outset? We can readily understand that the majority of those who were firmly grounded in the old state of things before our movement had made much progress, are likely to disapprove of what we are doing. It is so with every movement, whether in Art, Science, or Politics; the movement party are invariably maligned and opposed by those whose prepossession they disturb. It is an understood thing, and no one wonders at or complains of it. Mr. Tite, however, takes a higher ground; he admits at first that in some respects, and in some cases, we are right, and meets us on this ground; but at last winds up by denying that we are in the right anywhere, unless it be in Roman Catholic churches!

I will, however, crave your patience while I follow him into particulars. His first complaint is that our style is applied "to buildings for which classical architecture is more fitted, such for example, as town halls and markets." I rejoice to hear that there is such cause of complaint! *I* have long been complaining that it was *not* applied to such buildings, for which it seems to me so eminently adapted. Where, for instance, are finer town halls to be found than in the great Mediæval cities of Germany and Flanders; and where better market houses than the *halles* of the Flemish towns? They are only too good and too noble for us; but surely a style which produced *them*, and which has produced equally appropriate buildings for the humblest purposes of trade and husbandry, will not fail in giving us such modifications of its nobler conceptions as will meet our circumstances, whatever they may be. Only give us the chance, and I think we can show whether town halls and markets are unsuited to our style.

Mr. Tite next complains that in building churches in towns we do not respect the style of the "elegant" houses adjoining. I sincerely wish we could say much for the elegance of our town houses! They certainly carry out Lord Bacon's axiom. If they are built *to live in*, they assuredly are not generally built *to look at;* though it is the misery of our lot that we are hourly compelled to look at them! Be this, however, as it may, it is inherent on a period of change that such discordances of style should exist. The architects of the seventeenth century did not scruple to build in their own Renaissance style because surrounded by Gothic buildings; they even patched up the latter in their own style. No change would be made in anything were this principle to be admitted. It is simply the principle of obstruction, which comes ill from the Chairman of an Institute like ours, which professes to aim at progress.

If, however, our Vice President merely means that we build in our *towns* churches better suited to *rural* situations, I heartily join with him; but is this his own criticism? has he not, or might he not, have learned it from ourselves? I can refer him to able articles on the subject from the pens of leading members of our movement, in which he will find it impartially discussed, and our errors severely exposed. Surely, he will hardly venture to say that Gothic architecture is suited to the country but unfit for towns!* that it is unsuited to be placed near houses 70 or 80 feet high! I confess I have never heard want of height quoted as one of the defects of Gothic architecture. I do not know whether he refers to the church in Gordon-square as being unfit for such a position, but if he will look out from the side of Hampstead-hill, he will find that this *alone* among all the churches of London (St. Paul's and Westminster Abbey only excepted) is seen rising predominantly over the house-tops, and is a conspicuous object without the aid of a tower. All that keeps us from raising our town churches above the "elegant" houses around them is *our poverty;* a hindrance which would apply equally to any style; excepting that a Gothic church would be vastly improved if we could afford to make it tower above our houses, while an Italian church would probably be thrown out of all proportion by the operation. Our misfortune is independant of our style. We are compelled to build *town* churches with *country* means, and are then laughed at for building country churches in our towns. If we had the funds which were expended a few years back on some of the worst of our "classical" churches, we should not dread the proximity of houses 70 or 80 feet high, nor fear to be accused of building churches only suited to the country. But even if we have in some cases deliberately fallen into the error (which I think has sometimes occurred), that has nothing to do with the style, for no one will accuse Gothic architecture of falling short of the *classical* in *loftiness.*

Mr. Tite then proceeds to compliment the builders of some of the great City warehouses, and further on imagines what some Gothic architect would have made of them. Has he ever seen the *noble* and almost *majestic* Mediæval warehouses in some of the ancient German cities? A nobler type for buildings of their kind can hardly be conceived: they have rather too much roof for modern purposes, but are designed with a perfect appreciation of their use, and obtain their noble aspect solely from the simplicity and truthfulness with which their uses are provided for. Some of the finest warehouses I have seen in England and Scotland, built by persons who never thought about building in any style, but simply thought of doing *well* and *efficiently* what they were about, have struck me as having a strong family likeness to these stern and noble structures; and they certainly look better than the huge, over-corniced, though handsome, fronts in the city of London. It is curious that while Mr. Tite lauds our City warehouses in the same breath in which he speaks of the *small projection* in French street architecture, as showing that their architects lean "to the wants of the place and the times," Mr. Fowler very justly complains of their enormously projecting cornices as reducing, in narrow streets, the sky as seen from the street to one half! He might also have animadverted on the *frightful danger* they incur.

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* It is an unfortunate admission on the part of our opponents that Gothic architecture, while it harmonizes with the works of God, clashes so severely with the modern works of man.

After some very judicious remarks upon *fitness*, and on making a building suitable to its purpose, sentiments which, by the way, he will find admirably enlarged upon by Mr. Pugin in several of his works, and laid down as the key note of Gothic as distinguished from *modern* architecture—Mr. Tite returns to churches, selecting one which he has seen in the neighbourhood of a manufacturing town as a beautiful piece of copying, but as failing in all its practical uses. Surely, however, he will not argue that the mistakes of an individual architect are to be taken as condemnatory of the style he happens to be working in; or what style would escape? "The congregation *could not hear;*" but, is this usually the case with Gothic churches? The very reverse is more frequently the fact. Nor could they "*sit with comfort;*" but, surely a seat may be made comfortable or uncomfortable in any style! There was "*no ventilation;*" but is Gothic architecture opposed to ventilation? The "*warming* was defective"—surely a few more hot-water pipes would not have marred the style! "The clergyman *complained of the reading-desk*"—what clergyman does not complain of his reading-desk whatever be the style? It is said that every new incumbent of every church wishes to inaugurate himself by moving the pulpit; then why not complain of his reading-desk? Let him alter it to his mind, and it will not, I dare say, be less "Gothic" than at present, or less like what it would have been in Edward III.'s time! "Indeed the church is so inconvenient that *the people would rather stay away than go to it*"—but this may be the fault of the people and the clergyman as much as of the church—yet after all this, the church is "far more beautiful than the architects and masons of Edward III.'s time *could have made it!!!*" Really this *is too* complimentary! What! more so than *Exeter cathedral;* than *St. Stephen's chapel;* than the west front of *York;* than all the churches of Lincolnshire, or the church of St. Ouen, or the façade of Rheims?" If so, I do pity the taste of those who would rather stay away than go to it! I would willingly bear a little cold, or sit in an uncomfortable seat, for the luxury of seeing such a building!

Now, I think, I happen to know the church alluded to. It is, if I am right, a very nice simply designed church. It is generally (it is true) in the form of an old church, but is absolutely free from slavish copyism; instead of being a most accurate and elegant imitation of the style of Edward III, it comes home to my recollection as a somewhat severely simple adaptation of that of Edward I. Instead of being far more elegant than the old people could have made it, all little elegancies of workmanship are carefully eschewed. It is rather ascetic than elegant in its character. Instead of being a specimen of "*identical copying*" and having "no ventilation," it has the novel feature of the clerestory devoted to newly constructed ventilators in lieu of windows. Its seats are unquestionably faulty, as much an exaggeration of *lowness* as the seats of thirty years back were of *height;* and the hot water apparatus (whether or not from being constructed as a type of Edward III's days) does not answer. My own impression was, that this arose not from the style of the apparatus, but from the engineer having been chary of his pipes. There are possibly a few ritual affectations about the chancel which would be as well modified; things which usually depend more on the fancy of the clergyman than the architect, and certainly have nothing to do with the style; one thing however I observed, which I much liked—a large and cleverly contrived recess in the chancel for the organ, such as I have never seen in any church ancient or modern, and which certainly did not strike me as a specimen of copying or of "*want of all thought.*" The clergyman, however, not only complains of his reading desk, but of his pulpit. "Being made of stone it is so cold he cannot put his hand upon it!" Did this ingenious priest never think of the expedient of lining the top with cloth or velvet, which is usual even with wood pulpits? Surely a pulpit may be made either of wood or stone, whatever be the style of the church! It is usual to give the clergyman his choice, and I generally find them choose stone, forgetful of their hands; and among old pulpits I think I have seen more stone or marble ones of the Renaissance than of the Mediæval periods, and I do not at this moment recollect any of the time of Edward III. The last complaint is described "as a most enormous mistake;" it is that the altar rail only allows room for twelve communicants. It may be better to allow more, but if Mr. Tite will look into it at such a time, he will find that it really makes no practical difference, or very little, whether the rail be long or short, if the rule of the church be carried out of repeating the words prescribed to *each communicant*, or even to two together. If however the indecent custom be admitted of repeating them only to each "rail" of communicants, I admit that time is saved by making the rail long, but it is a custom more honoured in the breach than in the observance. Finally, however, we come to the "sweeping clause," which condemns all the forms of Gothic 'arcitecture as suited to the Roman Catholic religion and unsuited to our own; and on this ground, in Mr. Tite's *sincere opinion*, he thinks "the architecture which was learnt in Italy was much better suited than that now in fashion." So we are to go into Italy to learn Protestantism! The Popes then were sadly mistaken when they built St. Peter's! Little did they think they were erecting the type of Protestant architecture. I will not however follow out the subject, the fallacy of it is too obvious.

One word however on the subject of copyism. It is unquestionably one of the great vices of our day, and the more it is run down the better; but let us have fair play. *Laudari a laudato Viro*, is what we all desire; and we equally rebel against being blamed by those who wallow in the same mire with ourselves. Now, the classic architects have no kind of excuse for their copyism. They have been at work for three centuries and yet too often work like schoolboys; not only every detail is most abjectly copied, but they actually scruple not at copying nearly whole buildings at a time! If we are copyists, we have learned to be so in their offices, where copying is, with some bright exceptions, the sum and substance of architecture. They use *now* the very arrangement of leaves they find in ancient capitals, excepting that they fail of their spirit; even the triglyphs and guttæ, the symbols of transition from wood to stone when the Dorians adopted the materials of the Pelasgi, they copy to this day with scrupulous accuracy, and learn with infinite pains their proper proportions in decimals of minutes! and yet they have the conscience to accuse us of copying, because while learning and reviving the long neglected arts of our native country, we do not at once strike out into new developments. We have had first to make ourselves masters of our grammar, but already we develope more, we copy infinitely less, than they do after three centuries of training. I am one of those who have been behind the scenes, and have been put through all the facings of classical practice; and, while I admire genuine classical architecture quite as much as our excellent Vice-President (though I think another style more suitable to ourselves), I know too well the practice of modern classicism not to be fully aware that *ours*, with all its faults, is freedom itself compared with the copyism which preceded it. Our aim is *not to copy* but to *develope*, and to render our style the truthful expression of the wants and circumstances of our day; and to effect this great object will be the constant aim of,

My dear Sirs,

Your faithful Servant,

GEO. GILBERT SCOTT.

Avenue Road, December 3, 1855.

ARCHÆOLOGICAL STUDIES IN JERUSALEM,

By George J. Wigley, Associate.

Being Observations made at the Ordinary General Meeting of the Royal Institute of British Architects, February 25th, 1856.

Using the word Archæological in the French sense, I do not propose to treat of the topography of Jerusalem, but to limit my observations to the architecture of the past, in giving you the results of a year and a half's study; to which much might be added by further residence. I accept, without further remark, its traditionary topography, which is that of all ages, and has been well elucidated by the late Dr. Schultz, Prussian Consul, by Mr. Williams, and still better by Professor Willis, a master in archæological analysis.

There are three periods which may have influenced the architecture of Jerusalem, and which your knowledge of history will readily enable you to determine. The first is the *Jewish*,—the second the *Byzantine*,—and the third that of the Crusaders, or the *Latin* period. I shall make no allusion to the Mahomedan specimens of architecture in Jerusalem, as they are not so much connected with our immediate studies.

With regard to the Jewish period, it is difficult to find anything like ornamentation in the monuments of that time. We judge of western architecture by such marks, but in Jerusalem we are at a loss, though we find here and there a few Egyptian-like features, chiefly in the cornices of tombs, such as those of Zachariah and of Absalom.

I may state here what an ancient Jewish tomb is. The arrangements characterise it more than the detail. A large Jewish tomb consists of a porch from 3 to 6 yards in width, 3 or 4 yards in height, and sunk to the depth of 2 or 3 yards in a wall-like face of rock. In the middle of the porch is a very low doorway—something like the opening of a fire-place, through which we creep, and enter the funeral chamber, containing the "*loculi*," or places on which to lay the bodies, as on couches. Jerusalem is surrounded by these tombs. It is the city of the dead, *par excellence.*

A more complete notion of these tombs is given by some photographs taken by myself during my residence in Jerusalem; which, with others showing various remains in that city, I now exhibit.

To illustrate the small amount of ornamentation existing in works of known Jewish origin, I may state that the two great tombs of Absalom and Zachariah display a mixture of Jewish with Roman Oriental style; but in a little tomb in the village of Siloam, we find the Jewish characteristic I have mentioned. It very much resembles the Syrian example drawn by Mr. Scoles, and illustrated by Profesor Willis in his dissertation on the Holy Sepulchre. It is a monolithic tomb, carved out from the rock, and has no porch; a small vestibule leads from the first doorway to an inner one, inside which is a small room about 10 feet square, containing a large "*loculus*," where one body could be placed, and on both sides smaller "*loculi*," on which to place the bodies of children, or lamps. The cornice consists of a deep fillet, a large cavetto, and a thick orlo.* That is the whole amount of Jewish ornamentation we can find; and the whole very much resembles Egyptian architecture.

I may here allude to other peculiar arrangements of Jewish architecture—the Pools, which are very prominent features in Palestine; such as those at an hour's distance south of Bethlehem, called the Pools of Solomon, which supplied the whole of Jerusalem with water. Springs and sources of water are very scarce in Palestine, and it only rains in the winter; the water is therefore preserved for the supply of the whole summer by means of these large pools and cisterns. The pool of Mamilla is on the west side of Jerusalem, and there is another on the east, near the gate of St. Stephen, just overlooking the valley of Jehosaphat. The pools were not made merely to supply water to the inhabitants of the towns, but also for religious purposes. We have the remains of what is known as the Probatic* Pool, and I believe it is such, specially from its position with regard to the Temple. We have other pools in the vicinity of ancient temples, particularly a very large one near the entrance of the temple of the Samaritans on the top of Mount Gerizim, which is seldom seen by travellers. The Temple of Jerusalem is altogether destroyed, but we can resort to the Temple of the Samaritans, which having been a sort of copy of it, will give us some data so far as many of the details of such arrangements are concerned, which we cannot get at Jerusalem.

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* Torus.

I will pass now to constructed monuments, having hitherto dealt only with excavated ones; and in studying these, which give so little ornamental data, we must go deeper into archæological study as architects, and learn to *read a wall;* to know the masonry, and recognize the different touches of different periods. The mason of one day does not imitate the mason of another, but he gives his own stroke of the chisel in his own particular way; he is not educated to be a good copyist, and is it singular to find how different periods are monumentalized by the stroke of the chisel, as they are in palæography by the stroke of the pen.

In treating of the study of Jewish masonry, I will begin with some data taken on the authority of a Jewish writer, who, though comparatively a modern author, knew what he was about. Rabbi Benjamin of Tudela, in 1163, speaking of the Tower of David, says, "About ten yards of the base of this building are very ancient, having been constructed by our ancestors; the remaining part was added by the Mahomedans." This therefore is a good specimen of Jewish masonry. The Place of Wailing" is mentioned by very early travellers; and Benjamin of Tudela says "In front of it (the cupola of Omar) you see the western wall, one of the walls which formed the Holy of Holies of the ancient temple, it is called the Gate of Mercy, and all Jews resort thither to say their prayers, near the wall of the court yard:" you see here clearly what kind of masonry the Jewish is, as distinguished from later masonry. It consists of stones five or six feet high on an average, and sometimes extending (as in the south-west corner of the Temple) to a length of thirty feet. The four edges of the face of each stone are rebated to form rustic joints, but the centre is worked perfectly smooth. This is also the kind of masonry seen in the monuments which we must attribute to the Herodian period. In many of these latter walls, however, the stones, though of the same large size, are perfectly smooth, without rebated rustic joints. Starting from the Place of Wailing on the west of the Temple close and going south, we come to a good piece of masonry; the arch of the broken bridge spoken of by Dr. Robertson. It is made of very large stones, and as far as we can conjecture, must be the work of Herod the Great. We see above it masonry of small stones, worked smooth, of the Byzantine period, and above that Mahomedan rusticated masonry. This is in the southern part of the western side of the walls of the Temple close. We have just come to the south-west corner of it, and now turning to the south side, we begin to find something like architectural ornamentation. It is of the Herodian period, and we may call it of the Roman Oriental style. It is evidently of the same school as the monuments of the Romans in Italy, but differs from them in being overloaded with ornament. About the middle of the southern side of the Temple, we have an old gateway (the convent which the Knights Templars built afterwards cuts it completely in half), and the lower course of stones all along the wall show it to have been entirely of Jewish origin.

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* Sheep Pool.

Up to a certain height it is such; above are smaller stones, this part being probably of the time of Justinian; and above that another kind of masonry which may be attributed to the Mahomedans. This was probably the gate of the "*Prostoa*," described by Josephus as added to the Temple by Herod the Great, and which Professor Willis has completely identified from the position of the existing foundations. Going eastward along this southern side, we come to the three arches within the wall, which have been noticed by Williams and other writers. They are plain semicircular arches, evidently of the Byzantine times, yet it is a curious fact, that the western extremity of the series is placed exactly upon a jamb of the Herodian period; and the small size of the stones forming the archivolt compared with the immense size of the stones of the jamb is remarkable. The deep and thick mouldings on the jamb prove this to be an old Herodian doorway, capped by subsequent Byzantine work. The views of Jerusalem which you have seen will enable you to understand me when I speak of the south-eastern corner of the Temple close, which towers above the valley in a marvellous manner. The level of the enclosure is carried on vaultings. These vaultings I have not examined, but from the report of others, I judge them to rest on piers much older than themselves; and we may suppose the piers to have been also Herodian work, the vaulting being added afterwards, probably in the period of Justinian. Turning this corner to the eastern side, we come to another ornamented architectural feature, the Golden Gate, which consists of a double archway on piers; the arches ornamented with thick garlands of flowers, &c. We cannot so well describe the internal front, because as it is in the "Haram" (enclosure), we have not access to it. As far as I have seen it from a distance, I believe (and some illustrations from Mr. Catherwood warrant my conjecture) it is very much like the outside of the southern gate. Both fronts seem to be of the Roman Oriental style; but when we look through the loopholes in the exterior face, we see inside some much coarser work of a heavy Byzantine character. At the north-east corner of the Temple close, we see the manner in which the old masonry is distinguished from the new. The corners of the close were made more solid than the rest, and much more of the old courses of stone exists there. On the northern side of the Temple close, we have already noticed the Probatic pool; but this, like the other pools, having been restored by the modern Orientals, it is difficult to discern any old masonry in it. Passing on we come to the north-west corner, which, most likely, is the spot where the tower of Antonia stood. This tower was to some extent of the Herodian style, and here probably the second wall of the city terminated eastward. Here we begin to see some traces of masonry jutting out of the general quadrangle.

Where the Prætorium of Pilate is pointed out by tradition, we see the square of an atrium marked out by the rock being trimmed up to the masonry that was afterwards erected upon it; and on the eastern side of the present building there is a large quantity of ancient stones. The north-west corner was made by scooping the rock inside, to bring that part to the general level of the Temple close. Sometimes twenty or thirty feet of the rock were excavated to form the wall, as mentioned by Mr. Bartlett.

Here are the remains of a very ancient wall, which may be near the great stairs mentioned as having connected the tower Antonia with the enclosure, and by which the troops of Titus descended into the Temple area during the assault of the city.

On returning again to the western side of the Temple close, I have to notice two buildings still remaining. The first has the tradition of being the place of the Beautiful Gate; and the second, where the present town-hall of Jerusalem stands, is supposed to be the Chamber of Council of Josephus. These bear more the traces of genuine Roman masonry, the stones being not more than two or three feet high, and left rough in downright rustic, without any sort of plain face.

Near the north-west corner of the area is the traditional arch of the Ecce Homo. It is at a short distance from the atrium of Pilate, and is also an arch of Roman masonry. The mouldings which still exist on several voussoirs and on the impost, display the plain Roman colonial style.

We see other specimens of Herodian architecture about the town. At the traditionary spot of the iron gate we have pilasters of Roman work embedded in the wall. The medical man of the Jewish Protestant Mission having restored his house there, has confirmed the fact of considerable portions of masonry having been on the spot.

The rock tombs exemplify still better the Herodian school; among the most important of them are the Tombs of the Kings. The monument so called possesses important architectural features, and is one of the noblest royal tombs in the world. There is nothing indeed equal to it in solemnity but the recently formed tomb of Napoleon. It stands in the centre of an open Confession (in the sense we use the term in the Roman Basilicas) consisting of a court-yard sunk in the rock. Even that court-yard is divided into an inner and outer space, and is about fifty or sixty feet square. One portion of it consists of an inclined plane, divided from the rest by a wall of rock, and this communicates with the inner court-yard by a round arch, carved in the rock itself. Going northwards down this plane, turning to the left and entering the funeral yard, we have to turn again to the left to be in front of the tombs properly so called,—which are on the southern side of the court-yard. They are an amplification of the common kind of ancient Jewish tombs. The porch is adorned with an abundance of carvings in the live rock itself,—consisting of a Doric cornice enriched with bands of flowers and fruit. In the centre of the frieze is a bunch of grapes between two crowns, filling the space which would be otherwise occupied by a triglyph and two metopes. I regret to say that the central ornament now exists only in my photograph, an American traveller having knocked it off in order to take it home. There have been many suggestions as to the date of these tombs; a recent French traveller having the presumption to ascribe them to the time of King David. The photograph, however, will not lend itself to such fantastic notions; and in this respect it is the very best safeguard against the over-imaginative views of archæologists. As far as we can judge, it is a tomb of the Herodian period. We know that Herod the Great was buried at Herodium; we know where all the princes before Herod Agrippa the elder were buried; and the position of this tomb is close to what we believe to be the wall of Agrippa, and to the way which led from Jerusalem to Cesaræa, therefore close to a gate of that wall. The royal caverns are mentioned for the first time by Josephus in connection with the wall of Agrippa; we are therefore amply justified in thinking that it was part and parcel of the general adornment which King Herod Agrippa added to Jerusalem.

Another illustration of the Herodian period is the cornice of the noted tomb of the Judges. This tomb is three miles from Jerusalem; from the gate of the city of Agrippa to that spot there is a long line of rock tombs, forming as magnificent a funeral way as any in the world; quite as fine as the Via Appia, displaying indeed more thought and character, and executed at more expence. Even beyond that distance there are tombs. On one eight miles from Jerusalem, there are some fragments of a Doric cornice. In the famous tomb of Absalom an Egyptian cornice seems to crown the Roman work. Remodelling the monuments of the Jews may be fairly considered as part of the mania of Herod the Great; indeed he went to the extent of rebuilding the whole Temple for them. With this last tomb we conclude the series of illustrations of the first or Jewish period.

With the family of Herod the historical importance of Jerusalem ceased for a time, and it was only when Christianity became the religion of the Roman empire, that it again rose into importance. From the time of Constantine to that of Heraclius, the whole of Palestine, and especially Jerusalem its capital, might be considered the head quarters of Christianity. It was given up by the Roman emperors to religion, and was covered with churches, monasteries, and convents. The history of that period gives as the most prominent names in the country, those of Saints Jerome, Eusebius, Paula, Saba, and many others. The monuments however are scarce. We have a church in Jerusalem, which as far as we can conjecture, is of the time of Justinian. The present mosque El Aksa, we are told, was begun by one of the Patriarchs of Jerusalem and finished by Justinian himself; this was about the middle of the sixth century. I have not been able to enter it, but I believe it has been disfigured by subsequent constructions, both during the Latin and the Mahomedan occupation of Palestine. The only authorties we can follow in the matter are Procopius and the modern views of Mr. Catherwood. It appears to be of the Basilican form, and terminates with a transept; the apse, which has been destroyed, must have been attached to the transept without an intervening choir.

At Bethlehem (six miles from Jerusalem), there is one of the most complete Basilicas of the Byzantine times. It is more than 200 feet long, with five naves divided by four rows of columns, directly united by an entablature. It has a very magnificent transept, and terminates with an apse, both at the eastern and at each end of the transept. This church is illustrated in the work of Canina on *Christian Temples*. You will there see what a marvellous instance it presents of the Greek school of mosaic art; which, however, is of later date than the building. The monuments of this period in the Holy Land may be considered as the cradle of the Romanesque school of Christian architecture; for though I speak of them as Byzantine, these buildings have not what we know architecturally as the Byzantine character of the Romanesque; they possess more of the character of the Roman Basilica, like many existing churches in Constantinople itself. There is at Gaza a church attributed to the Empress Eudoxia. I have not been there, but from the descriptions of it given to me by learned visitors, I believe it to be a work of that period. I may mention also the church of St. John the Baptist at Damascus, one of the most wonderful monuments of the kind. It is 400 feet long.

Four miles south-west from Jerusalem we have a most interesting ecclesiological monument (one of the earliest), a complete tesselated pavement. It is not of the kind we generally see in Romanesque churches, and of which we have a specimen in the sanctuary of Westminster Abbey, but it is made of square pieces of marble, and resembles the specimens found in the Roman baths rather than in churches. This pavement is in the church of the Holy Cross, on a spot which was of no importance before the Christian period; we must therefore recognize it as a Christian work, and the emblems introduced in it bear out that view. It follows the shape of the church, which is of the usual Basilican form, consisting of a nave, side aisles, transept and triple apse; in the middle of the transept, under the lantern, is a magnificent wheel of mosaic pattern, thirty feet in diameter, containing all kinds of early Christian emblems, the lotus, the peacock, the fish, &c. The rest of the pavement which covers the whole church, is simply of white tesseræ, or scored with thin lines of black dadi* in a lozenge pattern; the pavement of the nave has a border or frame of a guilloche pattern of several bands. This church is mentioned by Sæwulf, an English writer of the twelfth century, in an account of his pilgrimage, as not having been destroyed by the Saracens, while the surrounding buildings and the cells of the monks were laid waste. It is a plain church, having square piers and slightly pointed arches, the apses, as usual in Palestine, being semicircular in plan, and slightly pointed in elevation. It is in fact a Transitional church, the pavement being of the Byzantine period, and the building about it of the school which we shall examine presently.

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* Dies.

A better specimen of the Transitional style however, is the *Church of the Holy Sepulchre* itself, which we all connect with Jerusalem as its chief monument. In its present state, the Church is in arrangement what the Crusaders left it, but the details are not altogether of the time of the Crusades. If we examine the capitals, we see the patchwork it is made up of. In the gallery above the part known as the Arches of the Virgin, are two rows of pillars corresponding with each other. Those on one side consist of Byzantine shafts fitted more or less to Byzantine caps, but on the other side the pillars are rude imitations, executed in the eleventh century; being probably a restoration by Constantine Monomachus, and showing the period most obviously.

With regard to the primitive shape of the Church of the Holy Sepulchre, I differ from the conclusions of Professor Willis. He starts with the explanation of Eusebius, but has put forth very mistaken notions in his interpretation. He conjectures that the Emperor Constantine began by placing the Holy Sepulchre in an open court-yard behind the Basilica. Eusebius mentions the sacred cave, or Holy Sepulchre, as the head of the whole work; and he again uses the word in his description of the great apse, which must make us conclude that the sepulchre was the centre of that great apse, which he speaks of as being so much ornamented. That would show that Constantine built his church in the general form of the Roman Basilica; we should have the apse at the west-end, which was then the altar-end of the church; because in the Basilicas the priest had his face towards the people, and to the east. When Eusebius speaks of the Basilica being to the east of the sacred cave, he evidently can only mean the nave and aisles; since he speaks of the magnificent ceiling which Constantine placed over it, as covering the whole of the Basilica; but that could not cover the apse. If he used the word Basilica to mean the nave and aisles in speaking of the ceiling, he might use it in another part in the same sense. The present plan of the church leads us to that conclusion. We know that when buildings are restored, the old foundations are used again in erecting the new building; and the first glance at the plan of the Holy Sepulchre will give us the outline of the Basilican form. Professor Willis remarks that the Basilicas at Constantinople are described as dromical, that is to say, having the same outline that the Hippodrome had, a rectangle terminated at one end by a semicircle of the same width. After this church had been destroyed by Chosroes it was repaired by Modestus, whose means certainly were very limited, and he only rebuilt it in part, and covered over the Holy Sepulchre by completing the circle, one half of which was traced out already by the great apse. In fact the remaining part of the circle, which we know to be the present form of the nave of the church of the Holy Sepulchre, is only given by the piers of the central part, and in no way in the general outline or in the aisles.

The holy sanctuaries in this church are after all only three in number,—the Holy Sepulchre, the Calvary, and the Prison of our Lord. Now the church consisting of five naves, the Calvary would come exactly in the inner lateral nave on the south, and the Prison of our Lord in the outer lateral nave on the north. I make no allusion to the fourth sanctuary—that of St. Helena, which must have always been a church complete in itself. It has all the parts of a good old Basilica,—nave, aisles, three apses, &c.; the southern apse, on a lower level than the rest, being the spot where the cross was found.

Just at the entrance of the Ethiopian convent, over the subterranean church of St. Helena, I found an arch nearly complete of Byzantine character, which I believe must be attributed to

Constantine, and seems to have been one of the arches of the atrium in front of the Basilica. There is only just room for a good sized atrium between the arch and the remains of columns which still exist, and which have been identified by Dr. Schultz and others as parts of the propylæum of the atrium of Constantine's church of the Holy Sepulchre. There is only just space again between the arch and the Holy Sepulchre for a good Basilica; the Holy Sepulchre therefore was inside the church, and indeed the head of the whole work.

Having so far given you an explanation of the church as a Byzantine specimen of the architecture of the Holy Land, I will now refer to it as an example of the Crusaders' period. The Crusaders found it consisting of the round church of the Holy Sepulchre, properly so called, and a few scattered chapels, one covering Calvary, and another the Prison of our Lord. They proceeded to arrange the church after their own ecclesiological fashions, and reversed the sanctuary, placing it towards the east, where the nave of Constantine had stood, and constructing the choir according to the manner of the time, in which the priest turned his back to the people. They afterwards made a transept, the southern end of which is now the generally known façade of the church of the Holy Sepulchre, and used the round church as the nave of the newly arranged cathedral.

To begin the illustrations of the period, I submit a photograph of the present entrance to the church or the façade of the southern transept, and a more detailed one of the doorway, which displays evidently the true features of pointed architecture. This brings at once to our minds the vexed question of the origin of Gothic architecture. It is remarkable that we are now coming to a full series of pointed churches, all dating from the three first quarters of the twelfth century. They could not have been built later, since the Latins only occupied Jerusalem from 1099 to 1187.

I am the more convinced that our Western Gothic is derived from the Holy Land, because it is the only country which (at that very period when we all know that fashion grew up) had sufficient influence to introduce Gothic architecture in so many countries at once. The Holy Land was the scene of the "universal exhibition" of the twelfth century for Christendom; the point where all European nations met on common ground, and formed themselves into one common type, and one common nation. The great results of such a meeting are evident in scientific discoveries. The Assizes of Jerusalem are the first modern code of law in existence; and we may well conclude that in architecture also the Latins devised one common type for themselves. Mr. Thomas Hope, in his Historical Essay on Architecture, has very skilfully delineated the progress of almost every variety of style; but he seems to leave a *lacune* to be filled up between a Byzantine monument which he considers the first of that kind, the aqueduct of Justinian the Second in which pointed arches were used as a fashion, and the time when they were commonly used in the west. He conjectures that the Mahomedans took their pointed architecture from the Byzantines, and I agree with him. The Arabs made ample use of it several centuries before it was used in the west. There are several Arab monuments in Damascus and Cairo, which can be traced to the ninth and tenth centuries.

And to corroborate, as it were, my theory that it was in the Holy Land the Western nations became acquainted with the pointed arch, we see that wherever in other countries the same meeting took place between the Eastern and Western schools, the same effect was produced, namely, the engrafting of the details of the Romanesque schools upon Arabic architecture. We see that in Spain and in Sicily. In Spain there are two distinct styles of Gothic—the northern and the southern; the latter being indigenous, whilst the northern style was introduced from France. In Sicily, where the Normans met the Arabs, they formed the same amalgamation. This was in the century which preceded the twelfth. But we cannot, with Mr. Gally Knight, trace to Sicily the origin of such a simultaneous school spreading all over the West. Sicily never was a *fashionable* country; but the Holy Land has been, and it is the only one we can mention as a centre from which such a general fashion could spread all at once. There is, perhaps, one exception to the assertion that all the churches which the Crusaders built were in the pointed style; but that very exception confirms my views. It is the church commonly called the Church of the Knights of St. John, which is built in the Norman Romanesque style, displaying billet mouldings, and all the other details with which we are familiar. We must reflect that this building, though of *about* the time of the Crusades, must have been erected a little previous to them by the merchants of Amalfi, who founded the hospital, which became the birth place and head quarters of the order, about 40 years before the Crusades. The merchants came from a part of Italy which was then under the Norman sway. There are some instances of architecture similar to this church in the district of Amalfi itself, and it is no wonder that these people should erect in Jerusalem an isolated instance of their own noble style.

In studying the Jerusalem of the Crusades we are more fortunate than in our other archæological investigations, owing to the researches of a friend of mine, M. de Maslaterie, Professor of the Ecole des Chartes at Paris, who has brought to light a most valuable description of Jerusalem in a Norman Chronicle of the end of the twelfth century. This has been published by Comte Beugnot in his edition of the Assizes of Jerusalem; and nothing can be more interesting than being able to go about Jerusalem with this Chronicle in our hands, identifying almost every spot described in it. I am afraid if I were to follow it out in detail, I should extend my lecture to greater length than the time this evening permits.

The continuation of the subject, without abridgment, was adjourned to the next meeting.

ARCHÆOLOGICAL STUDIES IN JERUSALEM,

By G. J. WIGLEY, Associate.

Being Observations made at the Ordinary General Meeting of the Royal Institute of British Architects, March 10, 1856.

I do not know whether it is necessary to bring to the recollection of my hearers, that in dealing with the monuments of Jerusalem at the last meeting, I described those of the Jewish and the Byzantine periods, and I began to make some allusion to those of a more interesting class,—the Latin. I shall now endeavour to describe the character of such of the last named monuments as are still to be met with at Jerusalem.

We must necessarily begin with the Church of the Holy Sepulchre, and although Willis has so fully illustrated it, I may as well recall to your memory some portions of his description. In dealing with the Church of the Holy Sepulchre, so far as the Latin period of its history is concerned, we must remember that it was rebuilt towards the middle of the eleventh century by Constantine Monomachus, after its destruction by the orders of the Caliph Hakem. Afterwards, we have, first of all, the description of Sœwulf, an English pilgrim, in 1103, who gives us a description of the state in which the Crusaders found the church.

Referring to the plan, we can easily ascertain what portion of the church is of the time of Constantine Monomachus, namely, the round Church over the Holy Sepulchre, the Church of the Calvary, and the Chapel of St. Mary, all of which are mentioned by Sœwulf, as well as the Church of St. Helena; the transept and the choir being Latin additions. Entering the present church at the south transept, the present façade, and going to Mount Calvary on the right, we notice adjoining it a little chapel, with many Mediæval remains. The chapel is now cut off from the church, the doorway being walled up, and turned into a grated window; but it contains glass mosaics along the archivolt of the former doorway, which must be of the twelfth century. This chapel was the external porch of the Church of Calvary at that time.

Inside the little Church of the Calvary, in the southern aisle chapel, which still belongs to the Latins, is a very good specimen of the mosaic known as Alexandrine pavement, being quite different from that which I described at the last meeting as existing at the Convent of the Holy Cross. Some of the monks told me that the chapel is covered with mosaics, but that they are hidden under a thick coating of mortar. Under the summit of the vault, a mosaic figure of the Saviour is to be perceived with the help of a torch; but the whole of this part is exceedingly dark. Portions of Alexandrine pavement are to be found also in the enclosed aisle of the round nave of the Holy Sepulchre, and in the Grotto of Gethsemane.

The general arrangements of the church are Mediæval. The proportions of the central part of the transept or lantern are strictly Romanesque, being about a square and a half in height to the spring of the arches which support the lantern cupola; then comes on the plan a square chancel terminating in a semicircular apse with radiating arches, and an encircling aisle with three radial chapels.

Out of the northern transept is the Church of St. Mary, which has an outline of Mediæval design. Going from that northern transept westward, we come to the present round nave, in the encircling aisle of which are also three radial chapels, or apses. One of the most interesting remains in that part is the old font of the church, which is found on going out of the northern of these apses into a yard behind the church. Several fonts like this are to be seen in the Holy Land. In fact they seem to be, as in England, the oldest of the monuments in any church which still exists. This font is mentioned by Willis as formerly being there, and I am happy to state that it still remains. It is octagonal inside, and square externally; each side of the octagon forming a semicircle, the plan is therefore like a rose. It is one of the ancient fonts used for baptism by immersion. There is one like this also in the basilica at Bethlehem, and I found one at Tecoa. The inside of these fonts was generally divided into two tiers; the uppermost being a hollow space of large diameter, and the lower one being narrower; so that there is a stone bench inside where a person might sit to be readily immersed by the priest. Close to this font in the yard there is a well which goes by the name of the well of St. Helena.

Two reservoirs on both sides of the church are alluded to by the Bordeaux pilgrim, A.D. 333, in his description of the Church of Constantine. The northern one still exists, and if not of Roman, is undoubtedly of Byzantine work; the southern one has disappeared. The same pilgrim mentions another at the back of the church to baptize infants, and this must be the well of St. Helena adjoining the old font.

I may allude to the Jewish tombs at the westernmost extremity of the church, just out of the western radial apse of the nave, and which seem to be fragments of a square funeral chamber cut diagonally by the foundations of the first church of the Holy Sepulchre. Dr. Schultz alludes to it, and remarks that it was not set exactly according to the cardinal points. Above this point, in the street outside, is the Latin western doorway of the church, which opened into the gallery or triforium of the round nave; for such is the difference between the street level outside westward and that of the church pavement, which was excavated round about the cavern of the Holy Sepulchre. This doorway (now walled up) is adorned with a shallow porch sustained on small columns and brackets.

Thus far I have alluded to the Church of the Holy Sepulchre as a Mediæval building, the Church of St. Helena belonging quite to the category of Byzantine churches, and having the usual divisions of those churches; and it is in reality quite apart from the general church, and at a much lower level.

On coming out of the Church of the Holy Sepulchre, we are induced to look about for the churches which must have surrounded it in the time of the Crusades, and we are amply repaid by keeping to the block of buildings of which it is the centre.

Immediately on coming out of the south transept, we have on the west of the entrance court buildings of the Mediæval period, being the three chapels, still in the position and use described by Sœwulf, as the parish church of the Greek Christians of Jerusalem.

In the southernmost chapel, the chapel of St. James, are some beautiful capitals of the form we usually see in the Mediæval architecture of the Holy Land, rude imitations of the Corinthian, with a considerable swell in the lower part of the capital; and there is some very good carving along the string courses and little arches of the chapel.

On coming out of the Church of the Holy Sepulchre we find, as mentioned above, a kind of court, surrounded on three sides by Mediæval buildings. At the southwest corner of this court is a whole column, and the bases of others which indicate that there must have been an arcade on the southern side, before the entrance to the Church of the Holy Sepulchre. This whole column, of which I have a photograph, appears to belong to the restoration of the church by Constantine Monomachus, and has a basket shaped capital.

We see in another photograph the Mediæval character of the southern transept, and what remains of the belfry of the church. Willis says it had formerly five stories, but at present there are only three.

Another photograph gives a general view of the Church of the Holy Sepulchre.

On the easternmost side of the court is a large Greek convent, occupying the site of the monastery of St. Mary the Latin. The lowermost story has three doors, as it is a building belonging to three communions; the first door leads into the Greek convent of Abraham, as it is now called; another belongs to an Armenian Chapel, and the third (nearest to the Church of the Holy Sepulchre) is the door of the Church of the Copts. All that mass of building has a very Mediæval character, and we have a description of it both by Sœwulf and the Norman Chronicler, who state that there was a church and monastery existing there under the name of St. Mary the Latin. We can still trace in the western wall of the general mass of building towards the court the remains of the façade of the Church of St. Mary, containing a large recessed arch which has been filled up with masonry, and which is very much like the façade of the tomb of Our Lady. That design of façade is repeated in many works of the Crusaders. The capitals of the columns which supported this arch are still to be seen on the face of the present wall.

Going further eastward of that group of buildings which I have described, we have a large fragment of a building which seems to have a very ecclesiastical character, and which, on examining it very closely, I believe we may consider to be the refectory of the canons of the Church of the Holy Sepulchre, pointed out by the Norman Chronicle, which goes on to speak of their dormitories, and other buildings on the northern side of the church.

In the street that skirts that northern side, we have evidently very considerable remains of that convent, and especially a doorway.

At the north-west corner of that group of buildings we know there was the Palace of the Patriarchs (it was inhabited by the Greek patriarchs after the expulsion of the Latins), and the large doorway and entrance are still preserved and used as a mosque.

At the north-east extremity of the same block there is a very interesting building, which goes by the name of the House of the Prince; and I believe it to be the Palace of the Latin Kings of Jerusalem. It is rather puzzling to make that out; but we know from the various chroniclers of the time that King Baldwin and other kings of Jerusalem dispensed justice in the Temple of Solomon; and we know further, from my friend M. de Maslaterie, who discovered the Norman Chronicle, of a Deed of Gift from Baldwin of the lower part of his palace to the first Knights Templars. We know that afterwards the Knights Templars occupied the whole of these buildings; but we know nothing more of the residence of the kings of Jerusalem. Many have conjectured that they resided in the fortress, but this building at the north-east of the Holy Sepulchre presents a much more likely place for their palace. At the same time I cannot quote any further authority than the local tradition, the want of any other site, and the considerable remains of twelfth century architecture on the spot.

Opposite to the southern façade of the Holy Sepulchre Church, in another block of buildings, we have the remains of the great hospital of the Knights of St. John; indeed, the whole southern side of the Church of the Holy Sepulchre was skirted by their hospital. It was a very large establishment, contained 400 knights, and covered perhaps four or five acres of ground. The greater part, however, is now a kind of elevated grass close, but I believe we can penetrate underneath it to a considerable extent through vaulted arches, which keep up its artificial height, and are distinctly to be seen at the south-eastern extremity of that block of buildings, where the present corn market stands. Maundeville says, that within the palace of the sick men of that hospital there were 124 pillars of stone, and 54 pillars besides to support the house.

I mentioned at the last meeting the first church of that order, erected by the merchants of Amalfi, which we may identify with the Church of St. Mary the Great, that part of the hospital having subsequently been allotted to women. We have to confirm this the deed of King Almeric of Jerusalem, apportioning between the knights and the nuns of St. Mary a small street which separated their convents; and an architectural eye can distinguish where the wall was erected, which must have been between the two opposite corners of these buildings.

Next to that block of buildings are the three large streets of the Bazaar, which exists in the same state as in the time of the Crusades, and they terminate at the south with the Exchange, or Bourse of Jerusalem of that time, now a Turkish café, with large ancient columns and capitals.

Alluding to hospitals, I may mention the hospital of the Germans, very near the Bazaars, the birth-place of the order of the Teutonic knights, and which I have identified from its position in the ancient street of the Germans, and from its particular masonry, which is the same as that of the ruins of the palace of Frederick Barbarossa at Gelnhausen.

In addition to these, there was in the north-east quarter of the town a hospital dedicated to St. Mary Magdalene. During the Crusades that quarter was inhabited by the Latins almost exclusively, and was called the *Quartier de la Marie* or *Merie.*

In that part of the town there is also a number of ruined Mediæval churches. We can trace the remaining apses of the Church of St. Mary Magdalene, covered with faint traces of painting; the nave and aisles being now turned into a potter's workshop. There is also a small deserted church dedicated to the Nativity of the Blessed Virgin, the plan of which is a miniature model of that of the Mediæval churches of the Holy Land. It is only thirty feet square, and has a lantern, a transept, a chief apse, and narrow transept aisles, terminated by side niche-like apses, and in front an external narthex. The cupola over the lantern is pointed in elevation, and circular in plan.

Close to the eastern gate of the town is the large Church of St. Ann, now a Mosque, of which I have an external view showing the twelfth century Gothic of the Holy Land, which, you will perceive, displays much of the feeling of our own Pointed. It consists of a nave, aisles, a transept with cupola lantern, and three apses.

In the northern part of the town, and at the north of the Temple Close, is the locality of the Prætorium of Pilate, on which a Mediæval church has been erected. The sanctuary remains, with two side chapels. It is perfectly square, and turned towards the *south,* without any attempt at an eastern direction, or an apse. The place of the nave is now a court yard, where formerly no doubt was the atrium of the Prætorium. Protruding from the general square outline of the court is a little chapel, which is very remarkable. It occupies the traditional spot of the Coronation with Thorns, and consists of a little dome resting on four piers, a fair specimen of the votive chapels with which the Crusaders covered every holy spot. The whole building is comprised within the barracks near to the present governor's residence. Nearly opposite was a similar chapel covering the spot of the flagellation, but since the Franciscans have resumed possession, they have spoilt its Mediæval character by adding a nave in an inferior modern Italian style.

Another Mediæval church of St. Peter, in the north-east quarter, is now a mosque on the top of the hill Acra. In this church, the angles of the square piers between the naves are occupied by half engaged columns, and the string courses, which are of the simplest kind, consist of a plain fillet and deep chamfer divided by a small rebate. All these churches are not so curious for ornament and detail as for the suitable and ecclesiological character which they bear. They consist generally of a nave and two aisles, and a transept from which protrude directly three apses, semicircular in plan, and covered with a plain concha pointed in elevation, that is to say, produced by half the revolution of a pointed arch, springing from a string course cornice. All the piers are square, and support pointed arches of a low pitch, with square soffits. They are vaulted with plain pointed groining, without any other attempt at ribs than plain transversal arches to each bay.

Towards the north-west corner of the town are some ruins of a large tower known as the Tower of Tancred, which existed at the time of the siege of the town by the first Crusaders. This was the part attacked by that warrior and the English Crusaders, while Godfrey of Bouillon entered the town through the north-east corner, which at that time was finished with a cant, and was the weakest part. The fortifications were afterwards altered, in that part, at the general restoration of the walls by the Turkish Sultan Suleiman, in 1542.

In the southern part of Jerusalem we find many Mediæval churches, particularly the large Church of St. James the Great, belonging to the Armenians; the Church of the House of Hannah, and some small churches having merely a nave and a little apse; such as the deserted church of St. James the less, behind the Protestant Church; the Church of St. Thomas, now a charcoal store; the Syrian Church of the House of John Mark, and the Church of the House of Caiphas outside the walls. Any description of these would be only a repetition, I therefore content myself with enumerating them. Many other churches are mentioned by the Norman Chronicle descriptive of Jerusalem in the twelfth century, and remains of them still exist. Outside the former town, on the east, there is the church of the tomb of Our Lady in the valley of Jehosaphat, at Gethsemane. It has an eastern and a western apse, and goes far under ground; a mere shell of rock, in the centre of the eastern apse, contains a funeral chamber which is supposed to have been the tomb of Our Lady, the surrounding mass having been cleared off, as for the tomb of Our Lord. On Mount Olivet the Church of the Creed, alluded to by Mediæval writers, is now a complete wreck; and it is a specimen of the way in which these monuments disappear. I found when I first went to Jerusalem twelve of the side arches existing; but I have seen it all excavated by the Turks to furnish tomb stones for the Jews. Of the Church of the Ascension there remains but the outline of its octagonal plan with two or three pier bases.

The last building I will allude to is, the little Church of the Cœnaculum. Here is a general view of the group of buildings which surrounds it. It is now held by the Mahomedans as the mosque of the tomb of David. It is nothing else than a Gothic church of the beginning of the fourteenth century, probably erected by the Franciscans, when they first came to the Holy Land. It has two naves, divided by round pillars, with ribbed and groined vaulting. What interested me most, was a dog-tooth moulding in the jambs of its windows. There is also a great deal of fourteenth-century carving, particularly vine garlands, along the string courses.

With regard to the dog-tooth ornament, I believe I may assign its origin altogether to the Holy Land, as well as that of the ball flower, which is repeated so commonly in Gothic buildings. The most common flowers in the Holy Land are the cyclamen or gazelle's horn, and the red anemone, to which our Lord alluded when he spoke of the beauty of the *lily*, as it is translated. The former is evidently the type of the dog-tooth, and the latter of the ball flower.

Before concluding, I may say a few words upon the remaining Mediæval monuments in the Holy Land, which do not belong so strictly to the Archæology of Jerusalem. It is useful however, to appreciate it, to consider well also the monuments of the thirteenth century, erected in places occupied by the Crusaders, after they were driven from Jerusalem in 1187, when the capital of the Latins was removed to St. John of Acre.

Richard Cœur de Lion came as near Jerusalem as Ramleh, and nearly the whole of Galilee was in the possession of the Crusaders during the 13th century. We have in many of those parts,—at Samaria, at Tiberias, at Cana, at Sephoris, and at Athlit (known as the castle of the pilgrims), Gothic remains of the thirteenth century, with rib vaulting in great profusion, and at the latter spot particularly we see a large ruin, very little alluded to by travellers.

At Athlit, pointed arches are placed upon early Roman masonry, and we have even round Roman arches cut into pointed ones. There is a church, one side of which consists of a Roman wall with square windows, and the rest of the church is finished with rib vaulting, and the ribbing is even disposed into the form of an apse. There are also the ruins of a large polygonal apse, alluded to by Williams in his Ecclesiology of Palestine, in the midst of Roman walls. This we may suppose to have been the site of the old citadel of the Templars, known also as the Castle of the Son of God; and most probably the true site of the ancient town of Dora. Just outside of Ramleh, we have extensive remains of a monastery attributed to the Knights Templars, with a large tall tower still standing. In the town itself, is a large Mediæval church formerly dedicated to St. Joseph of Arimathea; it is now a mosque, which I entered and leisurely examined, but from which I was at last expelled.

The Church of St. George at Lydda is referred to also by Mr. Williams in his articles on the Ecclesiology of Palestine, published in the Ecclesiologist in 1846-47. Local tradition ascribes this church to Richard Cœur de Lion. The large eastern apse and several piers still remain, and more may be traced along the former outline of the church.

With this I must conclude my remarks on the Mediæval architecture of Jerusalem. Of the present day there is very little ecclesiastical architecture to admire. The Easterns have no taste, and their churches are filled with lamps and ostrich eggs. But there is one point I may allude to as deserving attention in modern Eastern Ecclesiology; namely, the wood carvings, which are beautiful and skilful specimens of perforated work, having much of an early Romanesque character. Jerusalem is filled with the effects of the skill and industry of workmen in this branch of carving, who are still to be found in the Greek Archipelago.

I have to thank you for the kind attention you have paid to me; I have endeavoured to make myself as clear as possible, though I am rather unaccustomed to an English audience; and I shall be happy to stand catechising, if necessary, to endeavour to make myself better understood.

Mr. Scoles, Hon. Sec., inquired whether Mr. Wigley distinctly ascribed the Tombs of Jehosaphat and Absolom to the Jewish period, and to what particular era.

Mr. Wigley believed those monuments were decidedly of Jewish origin, from the plain Egyptian-like cornice which he had described. It was very difficult to decide their precise age, and he would therefore only say they were anterior to the time of Herod. Their mere weather-beaten appearance in such a climate, shewed that they must be very ancient.

Mr. Scoles said, that he had supposed these tombs to be of about the time of Herod.

Mr. Wigley. Herod had probably restored the work, but the Egyptian-like cornice clearly indicated an earlier date. There was a small monolithic tomb in Siloam, untouched by Herodian architecture, very similar to those of Zachariah and Absolom; and in the Tomb of Zachariah, the work of Herodian transformation seemed to be suspended in the midst of its operation in a most striking manner. As for real Jewish masonry in the walls of Mount Moriah, &c., there were two distinct kinds of masonry—rebated, and non-rebated. The former was generally described by travellers as formed of bevilled stones, representing the rebate as a chamfer, which conveyed an erroneous idea. In the Temple Close, the masonry of the southern, and of the eastern or golden gate, was entirely in one plane, without any rebate, and was quite distinct from the Byzantine or any subsequent masonry. He believed that the greater part of the Temple Close was much older than the time of Herod, and particularly the part called the Place of Wailing.

Mr. Nelson, Hon. Sec. It was stated that Herod rebuilt the whole of the Temple; and that subsequently there was not one stone left upon another.

Mr. Wigley. The Temple proper, or inner enclosure, was completely destroyed, and that by the most careful of destroyers, namely, a would-be *restorer*, Julian the Apostate; but the walls of the Temple Close had always existed. There was no kind of rustication about these walls; the joints were only rebated. The Roman masonry near the Close (as in the Town Hall *(Mekemeh)* and the entrance to the old Cotton Bazaar, erected on the traditionary spot of the beautiful Gate) *was* rusticated, the stones being on an average three feet high; and the Samaritan Temple on Mount Gerizim displayed what might be Greek or Roman masonry, being rough Rustic work of the kind termed Pelasgic.

Mr. Scoles. Did Mr. Wigley suppose that the Crusaders introduced the pointed arch into Europe?

Mr. Wigley. Certainly. The gradual amalgamation of the Romanesque details with the main features of the Arabic style could be clearly traced in Jerusalem. The first Crusaders were not masons, but military men, and they rebuilt the monuments which were destroyed, employing the artizans of the country, and giving them the best notions they could. There were also ecclesiastics following the army, but these were rather military chaplains, and not so educated in ecclesiastical architecture as the regular orders were at that time.

Mr. Nash, Associate, inquired what kind of roofs covered the churches at Jerusalem?

Mr. Wigley stated, that the churches of the Holy Land were generally covered with vaulting. Even the best modern houses were covered with vaults and cupolas cemented over, and the only wooden roofs were those of the Mosque El Aksa, the Basilica at Bethlehem, the large dome of the Holy Sepulchre, and of the Mosque of Omar. Timber being expensive and stone plentiful, might account for this; and the climate did not render any effectual system of roofing necessary. The timber roofs were covered with lead; the Protestant Church of Jerusalem was at first covered with slate, but lead had since been substituted. In the stone cupola of the little church of St. Ann, the joints of the masonry (as shewn in the photograph) were distinctly visible, but generally all the cupolas were covered with cement.

Mr. Papworth, Fellow, suggested that the profile of the cornice which Mr. Wigley had characterized as Egyptian, was in fact Ionian; and appealed to Mr. Fergusson in corroboration of this opinion.

Mr. Fergusson, Associate, stated that the cornice in question was undoubtedly of Assyrian origin. At Khorsabad and Kouyunjik, three or four cornices had been found with the same profile, combined with the Ionic order. The bevilled masonry was also Assyrian, and the same affectation of large stones was remarkable in both countries. With regard to the age of the works referred to, he did not think it could be anterior to the time of Herod. The Jew's Wailing Place, he had little doubt, was also of the time of Herod; because the Bridge, which, as no one doubted, belonged to that era, was so mixed up with the other masonry, that it must have been of the same age. In a gateway mentioned by Josephus, of which Mr Wigley had submitted a photograph, the ornaments were the only specimens of decoration of Jewish character which he (Mr. Fergusson) knew of about Jerusalem. They were neither Corinthian nor Roman, but quite peculiar, and were dovetailed into the south wall, which was of the same construction all across; therefore there was very little doubt that that part of the wall was of the time of Herod. [Mr. Fergusson here sketched a plan of the Temple area, and proceeded to explain its topography.] The south wall of the Temple enclosure was 927 feet in length, and at the distance of 600 feet from the S. W angle, a wall ran at right angles to it, completely confirming the assertion of Josephus that the Temple was 600 feet square. Beyond this this area was the series of vaults referred to by Mr. Wigley, and described by Professor Willis. The only document which Professor Willis had to reason upon, was a drawing by Mr. Catherwood. The pillars supporting the vaults were only 3 ft. 6 in. in one direction, and 3 ft. in the other, and they supported very weak arches; whereas, Josephus stated, that the pillars of the portico were so large, that three men spanning them round could scarcely make their fingers touch. It was therefore impossible that any such pillars could rest upon a pier below only 3 feet in diameter. Moreover, these pillars were disposed very irregularly, being some 15, some 20, some 30 feet apart, so that it was impossible for the pillars of the great stoa basilica of 40 or 50 feet high to have rested upon them. He felt no doubt, that the limit of the Temple was therefore the 600 feet marked by the eastern wall.

There were also three arches of very inferior and weak masonry [referring to sketch] of the Byzantine period; or if they were not of that period, they must have been added afterwards. He believed that these arches, with the vaults before referred to, were built to make a foundation for the Church of St. Mary, erected by Justinian. At one angle of the Temple, as thus circumscribed, there was one stone with Jewish mouldings. It was a single stone, connected with nothing, and leading to nothing. All these circumstances tended to prove that the Temple stood on the spot referred to, and that the 600 feet, which the wall shewn in the sketch circumscribed, was the limit of that Temple. Mr. Wigley had called the Golden Gate, Herodian, but the pilasters outside were debased Corinthian. So far as he (Mr. Fergusson) knew, there was no instance of a bent entablature before the age of Constantine; bent architraves there were, but not frieze and cornice. The first instance was to be found in the Palace of Diocletian at Spalatro. The Golden Gate was of the age of Constantine, and was built as part of the basilica which he erected in front of the Holy Sepulchre.

Mr. Wigley. The same scroll ornament or garland was found on the bent *architrave* or frieze of the southern gateway of the Temple Close, and on that of the Golden Gate, which was not properly an entablature.

Mr. Fergusson observed, that Mr. Wigley's photographs contradicted this. He made a stand upon the point, that these pilasters were debased Corinthian, and that no instance of a bent entablature could be referred to of earlier date; whereas afterwards, bent entablatures were the rule, and thousands could be referred to.

Mr. Scoles said, that he had a strong impression that the work was of the time of Herod.

Mr. Fergusson proceeded to mention the Mosque El Aksa, which was known to be the Temple of Solomon down to the time of Benjamin of Tudela. It was absolutely certain that Justinian did not build his church on the site of the Temple of Solomon, because Julian the Apostate attempted to rebuild the temple there, and it was considered during the whole middle ages an accursed spot. No apse could ever have existed there. The dome of the mosque and the niche of the mirhab were parts of the original structure. Therefore, there never could have been an apse there; and there was not a single Christian Church built by Justinian without an apse.

Mr. Wigley. In Jerusalem, to suit localities, many ecclesiastical rules were departed from. The same rule of the apse might be applied to the 12th century, yet many of the churches of the Crusaders had no apse. In the Prætorium of Pilate there was plenty of room to build an apse, but to keep to the general outline of the foundations, they finished the church with the genuine English fashioned flat end, and turned it to the South.

Mr. Fergusson. The Mediæval historians mentioned the coming of the Mahomedans, and described the appearance of the Temple, so as to leave no doubt but that they knew perfectly well then where the Temple stood, and what were its boundaries.

Mr. Wigley. The Mediæval expression, Temple of Solomon, was given to the spot where Solomon gave justice, and where his palace stood; but every one of the writers who called El Aksa the Temple of Solomon, made allusion to the Mosque of Omar as the Temple of our Lord.

[Mr. Fergusson and Mr. Wigley here discussed the topography of the Temple further in detail.]

Mr. Fergusson then referred to a statement of Dr. Barclay, an American missionary at Jerusalem, with regard to the water in the large tanks of the Temple at Jerusalem, and their communication with the pool of Siloam, which he conceived to be a strong confirmation of his views of the site of the Sepulchre.

Mr. Wigley stated, that there was a tunnel under the hill of Ophel at the foot of Moriah, through which he had passed, extending 1800 feet underground, and bringing the water of the fountain of Siloam into the pool of Siloam, but he knew of no communication between that and the Temple cisterns.

Mr. Fergusson observed, that this subterranean communication was noticed by Willibald,* who went to Jerusalem after the time of Justinian.

Mr. Papworth inquired in what the peculiarity existed which Mr. Fergusson stated to be the Jewish style.

Mr. Fergusson said, it was merely the scroll ornament or garland, which had a very Assyrian character.

Mr. Fowler, Fellow, suggested, that the word Temple was not sufficiently understood. It was sometimes applied to the main building or sanctuary, and sometimes to the whole of the sacred precincts; a difference which might account for some of the discrepancies as to the dimensions of the Temple.

Mr. Fergusson. The Temple resembled a mosque in having a large court yard, with a sanctuary in the centre. The Temple of Jerusalem was an enclosure of 600 feet square, with the Temple itself, or the sanctuary in the centre.

The Chairman (Mr. Penrose, V.P.) When the Jews went up into the Temple to pray, they did not go into the sanctuary itself.

To an inquiry whether the style of the Mahomedan buildings of the Holy Land resembled that of Constantinople, Mr. Wigley replied that the Mahomedan buildings of Jerusalem were quite plain. The convents of the Dervishes, on the western side of the area of the Mosque of Omar, were of a very plain kind, with occasional cupolas. The hospicium of the Hindoo Mahomedan pilgrims, close to the arch of the Ecce Homo, had very good and careful masonry, but nothing of an ornamental character. A large hospital of the fifteenth century, called the Hospital of St. Helena, in the same Mahomedan quarter, was a very fine building, consisting of alternate layers of variously coloured stone, the ordinary limestone of the country, a kind of imperfect red marble, known at Jerusalem as the marble of St. Cross, and a bituminous stone found in the neighbourhood of the Dead Sea.

To an inquiry whether the Mosque of Omar was a Mahomedan building, and of what date?

Mr. Wigley said, that the question was become one of theory of late, although all Mohammedan writers agreed in attributing it to the Calif Abdel Malik, in the seventh century. The appearance of the Mosque of Omar justified the idea that it was built in that century, when the Mahomedans were anything but skilful artists, and with Byzantine materials brought from other buildings. The name of the architect Abel mikdam Redja Hayvet, was mentioned by a Mahomedan author, Medjer-eddeen, who added, that he had red hair and a white beard.

Mr. Scoles inquired where Mr. Fergusson supposed the Church of the Sepulchre to have been?

Mr. Fergusson stated, that he placed it to the northward of Mount Moriah. He had, in fact, no doubt but that the building now called the Mosque of Omar was the identical Church built by Constantine over the Holy Sepulchre.

Mr. Wigley dissented from Mr. Fergusson's views, which appeared to him to limit Jerusalem to much too small a space.

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* It is Antoninus of Placentia, whom the Bollandists term an "*anile*" story-teller, who mentions an apple thrown in a well near the Holy Sepulchre coming out again at Siloam.—G. J. W.

Mr. **Fergusson** said, that far from doing so, he made it larger than the advocates of the present site of the Holy Sepulchre, who drew the wall so as to get it outside. His impression was, that the second wall must go round so as to enclose the present Sepulchre in the city, otherwise the inhabitants could not have been 20,000 at any time.

Mr. **Wigley** observed, that he had merely eadeavoured to illustrate the topography of Jerusalem as far as he was able. It had been discussed by much more able men than himself. Dr. Schultz had written a very learned and laborious work on the subject, and had traced the foundations of the second wall of Jerusalem, in a patient, and as he, Mr. Wigley thought, a masonic manner; indeed, there was as good an authority for the position of that wall, as for any point in architectural archæology.

Mr. **Fergusson** said, that he could not identify so many of the traces of the second wall which Dr. Schultz pointed out.

In reply to Mr. **Papworth**, as to the site of Golgotha, "the place of the skull," Mr. **Scoles**, Mr. **Fergusson**, and Mr. **Wigley**, explained its identity with Calvary, and that it was supposed to be included in the modern Church of the Holy Sepulchre.

Mr. **Wigley** observed, that the length of time occupied in the building of the city, would account for many irregularities in the first plan. It was first built as a military town, and occupied the site of Mount Zion, but when the ecclesiastical town was added by Solomon, it occupied also the site of Mount Moriah. Afterwards, the Emperor Adrian, who might be considered the designer of the present configuration of Jerusalem, and who was himself an architect, built the town all at once, and therefore chose naturally the outline which would include the most space with the smallest amount of fortification, and adopted a regular square plan.

Mr. **Scoles**. It was distinctly stated, that Adrian took in parts that were not enclosed before, and left out parts that were enclosed before.

Mr. **Fergusson** inquired by what author this was stated?

Mr. **Papworth** observed, with reference to the peculiarities in the masonry at different epochs, that M. Viollet-le-Duc (s. v. Brettoir) had made a similar observation to that of Mr. Wigley, in reference to Mediæval masonry; a great and distinct difference of tooling being perceptible in the different centuries. The faces were plain until the middle of the twelfth century—from 1150 to 1250 they were roughly indented, less so from 1300 to 1400, and they became again plain in the sixteenth century. With regard to the origin of the pointed arch, he had been informed that there was a little church at Ani, in Armenia, supposed to be of the date of 1010, in which both round and pointed arches were used, in such a manner, that the latter could not have been inserted at a later period. He had also heard, that the Armenians had always been the chief builders for the Turks throughout Asia Minor, and even Egypt.

Mr. **Scoles** stated, that Armenians were employed in the East for all building and handicraft purposes, to the exclusion of all others except the Maltese, who were known as the Scotchmen of the Mediterranean.

Mr. **Wigley** added, that whilst the Armenians were the best handicraftsmen, the Greeks were the best wood carvers and painters.

Mr. **Papworth** moved, and Mr. **Scoles** seconded, a vote of thanks to Mr. Wigley, which was carried unanimously.

Mr. **Wigley**, in acknowledging the vote, ascribed the success, which had attended his investigations, to his previous studies of the subject as a pupil under Mr. Scoles.

The meeting then adjourned.

ADDENDA.

I.—I have lately ascertained by enquiry at the British Museum, that the bunch of grapes, which was the central ornament of the frieze over the entrance of the Tombs of the Kings, described in page 96, is the special emblem found on the reverse of almost every coin of Herod the Great.—G. J. W.

II.—*The following Table of Architectural Dates in the History of Jerusalem is given to assist the Archæological Student.*

	BEFORE CHRIST.
City of Sion taken by David	1049
The Temple Built by Solomon	1012-05
Second Wall of Lower City begun by Hezekiah	713
Destruction of the Temple and City by the Chaldeans under Nebuchodnozzor	587
Rebuilding of the Temple by Zorobbabel	535-15
Rebuilding of the City Walls by Nehemiah	445
Rebuilding and Enlargement of the Temple by Herod the Great	30
	AFTER CHRIST.
Third Wall of the New City by Herod Agrippa I.	42
Destruction of the Temple and City by Titus	70
Rebuilding of the City by the Emperor Adrian as Ælia Capitolina, Adrian and Aquilla Architects	136
Building of the Church of the Holy Sepulchre under Constantine the Great	326-36
Completion of the Destruction of the Temple proper under Julian the Apostate, Alypius, Architect	362
Building of the Church of St. Mary under Justinian, Theodore, Architect	532
Destruction of the Church of the Holy Sepulchre by the Persians under Chosroes	614
Rebuilding of the Church by the Patriarch Modestus	615
Jerusalem taken by the Saracens under the Calif Omar	634
Building of Mosque of Omar by the Calif Abd-el-Melik, Abelmikdam Reja Hayvet, Architect	688
Destruction of the Church of the Holy Sepulchre by the Calif Hakem	1010
Rebuilding of the Church by the Emperor Constantine Monomachus	1048
Jerusalem taken by the Crusaders	1099
Jerusalem re-taken by the Saracens under Salaheddeen	1187
Ptolemaïs, or St. John of Acre, taken from the Latins by the Saracens under Ashraf Khalil	1291
Jerusalem taken by Selim I. Othoman Sultan	1517
Rebuilding the Walls of the City by Suleiman I.	1542-3
Fire in the Church of the Holy Sepulchre	1808
Restoration of the Church by the Greek Clergy, Commenes, of Mitylene, Architect	1810

The cost of the Restoration amounted to £640,000.; that is to say, £160,000. for the building, and £480,000. to satisfy the cupidity of the Turkish authorities.

III.—From the description given above of the pointed churches of the Holy Land, many will recognise a family likeness between them and the Cathedral at Monreale, and several smaller churches in Sicily, and in the south of Italy. In fact, they all belong to the same style—the earliest Gothic of all, the early Eastern of the twelfth century—a school of architecture hitherto entirely overlooked.

There are also in the East specimens of *rib-groined* churches (as that at Athlit of Galilee, and of the Cænaculum, mentioned in the Lecture), but they are all of the thirteenth century, and belong to the Gothic style re-imported from the West, after its Eastern models had been studied and developed, chiefly by the German freemasons.

Nothing could be more interesting for our art than a complete study of the monuments erected by the Latins, in the several states which they founded in the East, from the eleventh century till the conquest of Cyprus by the Turks in the sixteenth century.—G. J. W.

ON THE TRIUMPHAL ARCHES OF THE ROMANS.

By T. L. Donaldson, Hon. Sec. Foreign Correspondence.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, March 31, 1856.

The Earl de Grey, K.G., President in the Chair.

Having been invited by my colleagues, the honorary Secretaries, to bring before the attention of the Members this evening some topic connected with our art, I felt that, however unworthy to address this assembly on such an occasion, I could not resist the application.

On thinking over various subjects which presented themselves, it occurred to me, that Triumphal Arches form a class of monument rarely receiving the attention it deserves, and that there is much to learn and consider as to their origin, destination, and appropriateness, when considered as works of art. And that perhaps the subject is not altogether inapt on the present occasion,* when a professional brother receives from the hands of your lordship, as the organ of the Sovereign and his fellow-labourers in art, the highest distinction that can crown a life of earnest and zealous cultivation of a pursuit, which it is the object of this Institution to promote. He has this evening come to receive the honours of an ovation, of a triumph, the congratulations of his compeers, a brilliant and lasting testimonial, which must gild his future years. And although an arch of stone, of marble or of bronze be not erected, as they were of old to record the bloody victories of the Roman warrior, yet he is enabled to say with the poet—

> "Exegi monumentum ære perennius."

Before we proceed to examine the varieties and decorations of the triumphal arches, presented to observation in the illustrations, it will assist our full appreciation of their arrangement and embellishments, if we are acquainted with all the particulars of the processions, which the arches were intended to embody and commemorate.

Triumphal processions were of very early origin, and although writers are not agreed as to the precise Conqueror, by whom they were instituted, yet most appear to consider that Romulus was the first, who thus celebrated his victory over King Acron, whom he slew, and whose armour he deposited in the Temple of Feretrian Jove in the Capitol, being the first to dedicate such trophies as "spolia opima." From his time to that of Vespasian and Titus there were no less than 130 triumphs; yet so jealous had the Romans been, lest these ceremonies should be too easily decreed, that it was a law, that no triumph should be allowed unless 5000 of the enemy had been slain in one battle, and this was required to be verified on oath by the General.

The Conqueror having written to demand of the Senate a triumph for himself and army, the proposition was scrupulously examined, to ascertain if any objections existed to granting it, and none could receive the distinction unless he were Dictator, Consul or Prætor. These triumphs might be of two kinds: the principal one, when the Imperator passed in procession in a chariot through the city; or an ovation when he triumphed only on foot or on horseback, or with his troops proceeded to the Temple of Jupiter Latialis, on the Alban mount, a few miles from Rome. In the meantime the General with his cohorts awaited the decision of the Senate outside the Porta Capena, and in the plain under the Jamiculum hill, between the Vatican and the present Castle of S. Angelo. As soon as the permission was conceded, sacrifices were offered to Mars, Juno and Jupiter, by himself, if he had the dignity of the pontificate; if not, by the Pontifex Maximus. He then robed himself in his triumphal habit, assumed the laurel crown, and with the palm branch in his hand, distributed honours and rewards to his brave companions in arms. To some he gave collars or rings, to others consecrated spears, and money, and ornaments; to these golden crowns, to those silver ones. If any had first mounted the enemies walls, he had the mural crown. If he had seized a castle, the castellated one. If he had distinguished himself on board the vessels, a rostral crown; or had he performed any brilliant feat as a cavalry soldier, the equestrian crown. Each had his appropriate reward; and bucklers, cuirasses, helmets, shields, swords, or greaves, sumptuously carved by the most eminent artists, or most elaborately decorated, were profusely given—not only to individuals, but to cohorts and legions, as standards or portions of the spoils taken in the war. Nor were the people forgotten. To propitiate their good will abundant largesses were distributed profusely right and left.

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* The Presentation of the Royal Medal to W. Tite, Esq., V.P., M.P.

All the Temples were thrown open, and the several porticoes, theatres, fora, and other public buildings were hung with festoons and all sorts of ornaments; the houses and palaces on every side were decorated with hangings and tapestries, and everything that could contribute to the splendour of the festival, which was that of the people, as much as of the General and his army, and a source of joy to every rank and grade.

The procession, passing through the triumphal gate, was met by the Senate and accompanied by that august body over the triumphal bridge along the triumphal way, passed the Circus Agonalis, the Theatre of Pompey, the Circus Flaminius, the Portico of Octavia, the Theatre of Marcellus, the Circus Maximus, after which it fell into the Via Appia, under the arches into the Via Sacra, along which it proceeded through the Forum Romanum, and then ascended the Capitol to the Temple of Jupiter. This circuitous route was no doubt adopted in order to afford to all the opportunity of witnessing the magnificent cortege, and allow of a greater display of the objects, which swelled the lengthened procession.

The Conqueror rode in a chariot, which was round in the form of a castle, and in the earlier periods was drawn by white horses. Pompey or Camillus was the first to substitute elephants.* Eliogabalus introduced tigers and lions, to imitate the triumphs of Bacchus and Mars; and Aurelian was drawn by stags.

If the General had children, they sometimes were with him in his chariot, or if he had several grown up they accompanied him on horseback. Appius Claudius had his sister Claudia, the vestal virgin, with him, when he triumphed.

The description given by Plutarch of the triumph of Paulus Æmilius is so graphic and minute, and illustrates so fully the actual circumstances of this pomp, that we shall now adopt his words in order to convey an adequate idea of the splendour of that festival, which exceeded any, that had hitherto been given, and does not seem to have been surpassed in after times. "The triumph is said to have been ordered after this manner. In every theatre, or as they call it, circus, where equestrian games used to be held, in the forum, and other parts of the city, which were convenient for seeing the procession, the people erected scaffolds, and on the day of the triumph were all dressed in white. The Temples were set open adorned with garlands, and smoking with incense. Many lictors and other officers compelled the crowd to make way, and opened a clear passage. The triumph took up three days. On the first, which was scarcely sufficient for the show, were exhibited the images, paintings, and colossal statues, taken from the enemy, and now carried in 250 chariots. Next day, the richest and most beautiful of the Macedonian arms were brought up in a great number of waggons. These glittered with new furbished brass and polished steel, and though they were piled with art and judgment yet seemed to be thrown together promiscuously; helmets being placed upon shields, breastplates upon greaves, Cretan targets, Thracian bucklers, and quivers of arrows huddled among the horse's bits; with the points of naked swords and long pikes appearing through on every side. All these arms were tied together with such a just liberty, that room was left for them to clatter as they were drawn along; and the clank of them was so harsh and terrible, that they were not seen without dread, though among the spoils of the conquered. After the carriages, loaded with arms, walked 3000 men, who carried the silver money in 750 vessels, each of which contained three talents, and was borne by four men. Others brought bowls, horns, goblets, and cups, all of silver, disposed in such order, as would make the best show, and valuable not only for their size, but for the depth of the basso relievo. On the third day, early in the morning, first came up the trumpets, not with such airs as are used in a procession of solemn entry, but with such as the Romans sound when they animate their troops to the charge. These were followed by 120 fat oxen, with their horns gilded, and set off with ribbons and garlands. The young men, who led these victims, were girded with belts of curious workmanship; and after them came the boys, who carried the gold and silver vessels for the sacrifice. Next went the persons with the gold coin in vessels, which held three talents each, like those that contained the silver, and which were to the number of 77. Then followed those, that bore the consecrated bowl of ten talents weight, which Æmilius had caused to be made of gold, and adorned with precious stones; and those, that exposed to view the cups of Antigonus of Seleucus, and such as were of the make of the famed artist, Shericles, together with the gold plate that had been used at Perseus's table. Immediately after, was to be seen the chariot of that prince, with his armour upon it and his diadem upon that; at a little distance his children were led captive, attended by a great number of governors, masters, and preceptors, all in tears, who stretched out their hands by way of supplication to the spectators, and taught the children to do the same. There were two sons and one daughter, all so young that they were not much affected with the greatness of their misfortunes. This insensibility of theirs made the change of their condition more pitiable, insomuch that Perseus passed on almost without notice, so fixed were the eyes of the Romans upon the children from pity of their fate, that many of them shed tears, and none tasted the joy of the triumph without a mixture of pain, till they were gone by. Behind the children and their train walked Perseus himself, clad all in black, and wearing sandals of the fashion of his country. He had the appearance of a man that was overwhelmed with terror, and whose reason was almost staggered with the weight of his misfortunes. He was followed by a great number of friends and favourites, whose countenances were oppressed with sorrow, and who, by fixing their weeping eyes continually upon their prince, testified to the spectators, that it was his lot which they lamented, and that they were regardless of their own. He had sent to Æmilius, to desire that he might be excused from being led in triumph, and being made a public spectacle. But Æmilius, despising his cowardice and attachment to life, by way of derision it seems, sent by word, 'That it had been in his power to prevent it, and still was if he were so disposed,' hinting, that he should prefer death to disgrace. But he had not the courage to strike the blow, and the vigour of his mind being destroyed by vain hopes, he became a part of his own spoils. Next were carried four hundred coronets of gold, which the cities had sent to Æmilius, along with their embassies as compliments on his victory. Then came the Consul himself, riding in a magnificent chariot; a man, exclusive of the pomp of power, worthy to be seen and admired; but his good mien was now set off with a purple robe interwoven with gold, and he held a branch of laurel in his right hand. The whole army likewise carried boughs of laurel, and divided into bands and companies, followed the General's chariot; some singing satirical songs usual on such occasions, and some chanting odes of victory, and the glorious exploits of Æmilius, who was revered and admired by all, and whom no good man could envy."—(Langhorne).

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* A medal of Domitian shews a Triumphal Arch surmounted by *two* chariots back to back, each drawn by four elephants, and each containing the Emperor; alluded to in the 62 ep. of Martial.

"Hic gemini currus numerant elephanta frequentem."

It seems to be admitted that triumphal arches are of Roman origin; for we have no instance of such edifices in Greece before the Roman dominion. It may be presumed, that they may have first derived their form from the temporary erections of a rustic character, which may have been constructed to greet the conquerors as they approached the capital; or possibly were merely a more ambitious development of the rude city gates which were probably decorated temporarily, and called "arcus subitanei" for the occasions when the army returned after a victory. Fabrizzi, in his "*Roma*," enlarges upon the subject, and considers that probably the arch of Romulus was of brick. Even now some are of stone, as that of Gallienus at Rome; but of course the most important are of marble, as those of Septimius Severus, and Constantine. Some presented only one opening, with an attached column at each outer angle, as that at Susa and the one at Aosta. An example of a central archway flanked on each side by two columns is frequent, as in the arch of Titus at Rome, and in that at Pola in Istria; others had two openings of like size, which also served, like the Porta S. Maria Maggiore at Rome, as city gates, and this arrangement was peculiarly adapted for the purpose to prevent confusion in those entering or going from the city. Another class consisted of three archways, a central or larger one, and two smaller side ones, as in the arches of Septimius Severus and Constantine at Rome. That city was not the only one, which had triumphal arches in the centre of the city; for at Palmyra and Antiocheia there is one in the middle of the grand colonnade or avenue, which traverses the centre of these towns. Fourteen arches are enumerated by topographers as having been at Rome, from the description of historians and P. Victor. Of those which remain, the first erected to any emperor was that to Titus. They were however frequent wherever the Roman rule prevailed, for we find them in every province, in Western Spain, along the coast of Africa, to the South in Egypt, to the East in Syria, and Northward in Gaul. They also formed important features in many public edifices, as in the Circi, each of which had two or three, and in the fora also as at Pompeii. The via triumphalis and via sacra at Rome had a succession of them.

The Romans seem to have used the utmost license in regard to the decorations of these monuments, which, as being objects of show rather than of use, might admit of some caprice, and not be bound down to the severe canons of the art. It would appear that the composite order owed its origin to them, as affording greater opportunity for the accumulation of enrichment; but, although it is considered to be of a more elaborate and elegant character than the Corinthian, yet in truth it departs from the grace of the latter, and is heavier instead of being lighter in its proportions. The capital is obviously so, when we consider the heavy volutes of the Ionic being substituted for the caulicoli of the Corinthian. The pedestal under the columns is a peculiar feature of the triumphal arch, as also the attic above the entablature, which gives increased altitude to the mass, and tends to upraise the glorious groups of sculptures, which surmounted the whole as a crowning galaxy of splendour. Nor did the ancients consider themselves confined to any one order, for we find at Arsinoe in Egypt the Doric. This presents a tetrastyle frontispiece surmounted by a pediment, and having in front of the pilasters on each side superposed Corinthian columns and entablature of less size. In others the Corinthian or composite is indifferently adopted; but the most remarkable license occurs in the arch at Aosta, which has columns of the Corinthian order surmounted by a Doric entablature, a contrast, which recals the trite remark of Horace as being applicable to architects, "quidlibet audendi."

The sculptures which adorn them are remarkable and valuable, as they hand down to us many of the incidents of the wars, which they were intended to commemorate; or circumstances in the life of the Emperor, whose memory they were proposed to honour. The arch of Titus bears even now the full sized representation of the seven-branched candlestick and other trophies of the Jewish war. It also gives the apotheosis of the Emperor upborne to heaven on an eagle's wings. The sculptures, which crown the attic, must have been most profuse and sumptuous, consisting of the conqueror borne in his triumphal chariot, attended by Victories and his family on horseback, flanked by trophies and warriors, forming together a numerous retinue of attendants. These probably were most frequently of bronze, possibly gilt; and the whole surface presented an elaborate profusion of sculptured embellishments. The soffits of the arches were richly coffered, the panels were filled with continuous scrolls, the friezes with processions, the spandrils to the central arch were enriched with figures of Fame proclaiming the glories of the conqueror, and the very keystones themselves were emblematically carved with winged victories.

But it appears that they were also of marble, for Pliny, l. 36, c. 5, mentions the triumphal arch erected by Augustus to Octavius, surmounted by a chariot with four horses, on which the figures of Apollo and Diana were seated, all carved by Lysias out of one block of marble, and highly praised for its excellence and great artistic merit. In fact a triumphal arch without these full groups of figures would have been considered deficient in its chief purpose and decoration. The arch of Nero (on a coin) with its pendant festoon shows how these monuments were decorated on festive occasions.

It is remarkable that Vitruvius never alludes to triumphal arches. We may thence infer that few existed at his time, and these were not considered a special class of edifices, and had not the peculiar characteristics, particularly of the composite order, by which they were subsequently distinguished.

Consult also Bergier, Histoire des Grands Chemins de l'Empire Romain, 4to, Paris, 1628—Piranesi sopra gli Archi Sparsi in Italia—Panvinius (O.) Amplissimi Ornatissimi Triumphi, 4to. Antw.—Rossini Gli Archi Trionfali, onorarii e funebri degli antichi Romani, &c., fol. Roma, 1836.

TRIUMPHAL ARCHES.

In Rome.

Arcus Claudii Drusi,
„ Constantini,
„ Dolabellæ et Silani,
„ Domitiani,
„ Fabiani et Allobrox in Sacrâ Viâ,
„ Gallieni (Lapideus)
„ Gordiani,
„ Gratiani, Valentiniani et Theodosii,
„ Jani Quadrifrontis,
„ Marci Aurelii et Lucii Veri (in Corso),

Arcus Neronis in Capitolino Monte,
„ Octavii,
„ De' Pantani,
„ S. Laurentii,
„ S. Sebastiani aut Porta Capena,
„ Septimii Severi,
„ „ in Foro Boario,
„ Tiberii,
„ Titi.

In Italy.

Ancona,
Aosta,
Benevento,
Rimini,
Susa,
Verona (2).

In the Provinces.

Pola in Istria,
Athens (?),
Antiocheia,
Palmyra,
Antinoe, Egypt,
Africa (various).

France.

Arles,
Autun,
Carpentras,
Cavaillon,
S. Chaumas (Pons),
Orange (Charii),
Postumi,
S. Remy,
Reims.

N.B.—Where the proper ascriptions of the arches have been recognized, the original name is given, but in other cases, the usual modern name is preserved to insure the identity.

The PRESIDENT expressed to Mr. Donaldson the thanks of the meeting for his instructive and interesting communication.

The PRESIDENT, in presenting the medals and prizes for the year 1855, addressed each of the gentlemen to whom they had been awarded in terms of commendation and encouragement.

On Mr. TITE coming forward, amid much applause, to receive the Royal medal, the PRESIDENT said, he expressed his satisfaction last year, on presenting the Royal medal, at the fact of its being conferred upon a foreigner, as he felt that it was an indication of impartiality, and that nothing like favouritism had influenced the distribution of the Society's highest honour. Having thus expressed himself in favour of M. Hittorff last year, he had, with equal gratification, to express the great pleasure he experienced this year in having to present the Royal Medal to an Englishman. (Applause.) Mr. Tite was well, deservedly, and universally known to them. They had in one of the greatest works in the City of London a production of his genius and design, and he hoped they would have many others equally useful and important, if not so rich, so ornamental, and so elaborate; for it should be remembered, in the profession of architecture, there was no one thing more important than that a man should be a man of versatility, and able to deal with all the different subjects that came before him. A man might be an excellent architect for a great work, but he might fail in the design or execution of a minor one. He might be unequalled in the execution of a highly elaborate and ornamental work, but might fail in a simple and a small one. Mr. Tite, however, had not confined his genius exclusively to one of these, but had shown his capability and power in one no less than in the other; to use a homely simile, like the elephant with his proboscis, he could lift an oak, or take up a straw. The honoured recipient of the royal prize had exhibited in many instances not only his power of design and imagination, but his facility in dealing with and adjusting difficulties—of conciliating and adjusting differences of opinion, of bringing people to agree together who had previously been antagonistic—an accomplishment of rare possession and of immense importance. A man might have the greatest taste and the greatest ability in his profession, but yet be deficient in those qualifications, and so be prevented from being permanently and positively useful. When he (Earl de Grey) had the pleasure of collecting his friends round him last year, he regretted being deprived of the pleasure of Mr. Tite's company by the new engagement that gentleman had embarked in, which he hoped might conduce, not only to his own interest, but to that of the profession of which he had been so great an ornament. Since then, and consequent on Mr. Tite's efforts in his new sphere of Parliamentary usefulness, the profession, he believed, had been indebted to his efforts and weight and experience for advantages which, perhaps, would not otherwise been obtained. (Applause.) He (Earl de Grey) believed that certain legislative provisions that had been lately passed were in a great degree attributable to the efforts made by Mr. Tite in the new position in which he had placed himself, and for which the whole profession and the community were truly grateful; and he only hoped that in all future time he might lay his fame and fortune on a sound and constitutional concrete—that his footing and foundation might be firm, and the superstructure such as might realise most completely his own expectations and the best wishes of all his friends. He (Earl de Grey), on the part of the Institute, and with the sanction of Her Majesty, had the utmost pleasure in presenting the Gold Medal. (Applause.)

Mr. Tite said it had been the custom of the Institute to permit the recipient of this, its greatest gift, to return thanks in a few words; but he would first say, he thought the Institute was deeply indebted to the Noble Earl for his kind condescension in attending on occasions like the present, and in so gracefully enabling the Society to record its wishes and feelings in regard to the recipients of its honours. For himself, he had to thank his Lordship emphatically for the very kind and gracious way and words in which he had been pleased to pay him such distinguished compliments. He also felt that he owed a debt of heartfelt thanks to those of his compatriots in the profession who had grown up with him and about him, amid the difficulties and tasks—the arduous and anxious duties of a long professional life; while, at the same time, he was bound to acknowledge, in the grandeur of the gift, the recognition of Our Gracious Sovereign. While, on the one hand, he had to thank the Council and the Institute who had unanimously accorded to him the noble compliment, he had, at the same time to recognise the gracious condescension of Her Majesty in placing so high a distinction so nobly at the disposal of the Institute. (Applause.) In looking back over a long professional life, now drawing nearly to a close, he could not help expressing his conviction that the Institute owed a great deal to his Lordship, and perhaps something to the individual who addressed them in regard to the position of the Institute itself. There was a time when there were two societies, both existing together, and both running a race inconvenient and undesirable—inconvenient on the one hand because supported by a comparatively small profession, and undesirable in many respects, but principally because it increased that which belonged, more or less, to all professions,—a certain amount of professional jealousy. At the period he referred to he felt that he held an honourable position in the Architectural Society, as its President; but, at the same time, though he had the ambition of being there, and felt proud of that position, yet with these same feelings, he knew it was desirable that this distinction and this difference should be terminated. In the Noble Earl he found a most active supporter, meeting him in every possible way, with a view to unite the two societies; and, on the other hand, a great Prince (the Duke of Sussex), now no more, always the patron of art and science, condescended to listen to the recommendation he suggested; and co-operating with the advocacy of the Noble Earl, the two societies, he was happy to say, became one. This was the instance in which he had to thank his Lordship for his kind co-operation, and in which he (Mr. Tite) thought he had some claim for the humble part he took in it. (Applause.) From that time to this, he had been anxious to give all the time and labour and influence he could to the Institute, although frequently interrupted by the circumstances his Lordship had referred to—an active professional life, and very large professional engagements—which had prevented his doing all he desired; but he felt in the compliment paid him that night that the Institute itself declared he had at least done something towards the interests of the Institution to which he had the pleasure to belong. (Applause.) The strife of politics and party had little to do with the quiet pursuits of peace; but he was induced to forego the honour of being at his Lordship's last annual gathering at the invitation of a large constituency—that of Bath; and he felt that in gaining that seat he had obtained a position that any Englishman would be proud of, and that it was one of the highest privileges that any gentleman could possibly obtain—the unbought suffrages of a large and enlightened constituency, enabling him to assume a place, humble as he was, in that legislative assembly that ruled the destinies of Europe. (Applause.) He hoped that the event of yesterday—the announcement of peace—declared from the cannon's mouth throughout the metropolis, and which made every heart throb with joy, would enable the Legislature of this country to turn their attention to the arts of peace, education and refinement, and that the statesmen and ministers of the day would henceforth show the world that we were just as powerful to excel in the arts of peace as our own countrymen were great and noble in the art of war. (Applause.) The remembrance of the royal gift, presented to him that day, would induce him as long as he lived to do all that he could to promote the best interests and support in every way the advantages offered to the profession by the Royal Institute of British Architects. (Loud applause.)

ON OPEN FIRE PLACES WITH REMARKS ON THEIR CONSTRUCTION.

By S. E. Rosser, C.E.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, April 14th, 1856.

In a climate such as ours, subject to greater vicissitudes of temperature than occur in most other countries, the open fire-place is not the least important of the means by which these disadvantages are partially overcome. It is a subject of frequent remark that people complain of cold in an apartment maintained at a temperature of sixty degrees by the introduction of warmed air, while no fault is found if the room has an open fire although the temperature may be four or five degrees lower.

The principle objections to the open fire-place as ordinarily constructed, are the large expenditure of fuel in proportion to the effect produced, and the difficulty of warming an apartment equally and effectually. According to Dr. Franklin, not more than a fiftieth part of the heat generated was rendered available for warming apartments when he resided in England (1725); somewhat later (1798), the loss was estimated by Count Rumford at fourteen fifteenths, and recently by Dr. Arnott at seven eighths of the whole quantity consumed.

The heat which escapes in the smoke is computed at more than one-half; the loss by the warmed air of the room constantly entering the chimney above the fire is said to be two eighths, and one eighth of the fuel is supposed to pass away unburnt in the smoke.

In reference to the unequal heating at different distances from the fire, it is observed that the effect of radiant heat is inversely as the squares of the distances; so that the walls of an apartment are scarcely heated and therefore reflect no heat on persons in the room, who, if they sit at a distance from the fire, are too cold, and if near it, are too warm. More serious causes of objection are the cold draughts created by the air rushing in through the crevices of the doors and windows, and playing upon the backs of persons sitting round the fire; or forming a cold bath several inches in depth on the floor, in which their feet are constantly immersed. Another objection, but hardly a just one, is bad ventilation. That the usual mode of ventilating a room by the air escaping from it up the chimney is not the most perfect, may be admitted, but it is at least a tolerably efficient method, and infinitely superior to that afforded by the thermometer stove, or any of the varieties of Russian, German, American, and Swedish stoves; being objectionable rather on account of certain contingent disadvantages than of its inefficiency.

The last objections are the smoke and dust.

All these objections applied, more or less, to most of the open grates in general use when Dr. Arnott's Treatise on Warming and Ventilation was published, or to the flues or fire-places provided for them, and they have been received by many as conclusive against the open fire-place being worthy of adoption, as a mode of warming, in a scientific age.

It is the object of this paper to show by what improvements the open fire-place has been, or may be, rendered less obnoxious to these objections, and of more enlarged utility.

Among the first who directed attention to the improvements of the domestic hearth, Count Rumford is the best known in this country. The alteration which he made was very simple, but its success had the effect of re-modelling all the arrangements of the fire-place, and it has been the parent of the numerous register stoves now seen, which have swept away the goodly chimney corners and wide open fire-places of our ancestors.

This change was effected by contracting the throat of the flue. Within the large cavity of the chimney opening he formed, as it were, a second fire-place by building a wall in front of the chimney back, and so much in advance of it, that when carried up to the level of the arch at the back of the mantel, a space of not more than four inches was left for the depth of the throat from the back of the arch to the face of the new wall. He then contracted the opening over the fire by placing upright covings of brick in each interior angle of the recess. These formed an angle of about 135 degrees with the back of the fire; the distance between the re-entering angles of the covings being in no case greater than the width of the perpendicular part of the flue. By this arrangement the area of the throat of the chimney was reduced to seventy-two inches, and in many cases made even a third less.

To facilitate the sweeping of the flue, the upper part of the back wall was formed with a slab of stone, or fire tiles, which could be pushed back to allow a boy to pass into the flue, and afterwards replaced.

The immediate results of these alterations were the entire prevention of smoky chimneys, increased heat thrown into the apartment, and a degree of general comfort previously unattainable.

Soon after Count Rumford's fire-places had become known, register stoves having somewhat the same appearance were introduced.

Their elegant design, in iron and polished steel, and Rumfordised form, did not obviate the bad effect of substituting metal for non-conducting material, fire-brick.

In these stoves the metal back of the grate would soon be destroyed if the heat were not rapidly carried off by the air on the other side, in the cavity purposely left behind the stove which communicates with the chimney. The very circumstance, however, of the iron back being preserved by constantly parting with the heat received from the fire to the air behind it, prevents the fuel in its vicinity acquiring the temperature necessary for perfect combustion. In a grate with iron sides and back, the fuel in contact with the iron is always seen black on the edges, and the fire cannot be made to burn vividly, or without forming smoke. But when the grate is lined with fire-brick (which is a bad conductor), of considerable thickness, the brick retains the heat imparted to it by the incandescent fuel, upon which it re-acts, until the fuel and fire-brick are heated up to a clear bright fire, free from smoke and presenting a mass of radiant incandescence, having three times the power of a grate holding the same quantity of fuel but lined with iron. Very little heat can be obtained by radiation from a small fire in an iron grate, but a very small grate lined with fire-brick will give out a large quantity of heat, and less of the fuel escapes up the chimney.

A very cheap, efficient, and handsome fireplace may be formed on the model of Count Rumford's by filling the chimney opening with what is known in the trade as a "sham," *i. e.* the front of a common register stove without any of the ironwork that forms the body. The place for the fire is formed by building up the sides and back with fire-brick, and giving to each coving an angle of about 135 degrees with the back. The bottom grate is from five to seven inches deep from front to back, according as the front bars are straight or curved; and the brickwork at the back slopes upwards for about twelve inches from the bottom grate, and is thence carried up with the covings as high as the centre of the arch over the chimney opening. At this level the throat of the flue is contracted by fire-tiles, stone, or an iron plate, to a breadth from front to back of about four inches.

The sweeping machine generally renders the moveable slab unnecessary. If, however, free access to the flue above the throat is required, the contraction can be made with an iron plate, hinged to the back of the front, like the top flap of a common register stove.

Count Rumford made the flue opening into the chimney as nearly as possible perpendicular over the burning fuel. The discovery that this is not an essential condition has of late years led to the introduction of an entirely new class of stoves, in which the fire-place is closed completely over at top, and the smoke passes into the chimney through a luffered opening at the back.

Both the last-mentioned stoves throw out an amount of heat, which few register stoves with fire-places of the same size are capable of emitting.

That the position of the fire near the hearth is of the utmost consequence to the efficiency of any grate is now universally acknowledged. This position lessens the direct radiation upon the faces of persons sitting near the fire, and throws more upon the legs and lower part of the body. The property of warmed air to ascend renders it necessary, for the general warming of a room, that the fire should be as low as possible, because heat, though readily carried upwards, cannot be communicated downwards. Hence the difficulty with the old fashioned grates, mounted up fifteen or eighteen inches from the floor, of heating the air of the room below the seats of the chairs.

But an attempt has lately been made to revive the fashion of putting the fire half way up the chimney, and it has been argued that when it is considerably above the floor it will be in a better position to radiate downwards than when nearly on a level with it. This argument, however, is based upon an imperfect appreciation of facts. If the fire were a globular body, equally incandescent over its whole surface, the amount of heat radiated from its underside would be as great as that thrown upwards or forwards. No fire-place, however, that has yet been constructed is equally incandescent on all sides.

The Staffordshire fire-place, as it has been termed, is the nearest approach to the globular form, and it throws out more heat from its under surface than any other fire-place. The bottom of an ordinary grate is a mass of iron-work, which intercepts any amount of radiation, and this iron-work does not even become tolerably warm, because it is kept cool by the current of cold air rushing over it to feed the fire. Moreover, the space between the bottom bar and that immediately above it is commonly filled with dead ashes and dust, which materially impair the efficiency of this part of the fire, even to radiate heat in horizontal lines. The more we consider these facts, the more we shall be convinced that it is only the upper surface of the fire, and that portion of the front which is comprised between the two upper spaces of the bars, that are of any value in regard to radiating power.

The restoration of the fire to its old position on the hearth led to the innovation of placing the aperture for the escape of the smoke at the back of the grate instead of over the fire. In Sylvester's grate, the opening into the chimney is at the back, and it is provided with a series of louvres, which can be opened or closed at pleasure. The draught is always strongest through the lowest of these openings, two of them (giving in ordinary cases an area of about from twenty to thirty inches) being generally sufficient to carry off the whole of the gaseous products of combustion. The upper louvres may be opened to give increased ventilation where no other outlet is provided. As less air escapes up the chimney in this grate, the indraught of cold air is proportionately less, and as the low position and the extensive radiating surface allow the calorific rays to penetrate to the lowest level of the apartment, the entering air derives a larger portion of heat from the floor in its passage to the fire. Experience has proved that this stove is capable of producing about double the effect of an ordinary register, with an equal quantity of coals. Estimating the amount of heat radiated at fifty per cent. of the calorific power of the fuel, and measuring the superfices of uninterrupted radiating surface from the burning fuel and from the sides and back of the grate, we conclude that the amount of heat radiated from this grate is not less than three-eighths of all that is evolved in the process of combustion. Since the invention of Sylvester's, several stoves have been introduced, which possess considerable merit, and mark a tendency to adapt a principle of construction essentially different from the great improvements of Count Romford. Stevens', Wright's, and Jobson's, are excellent specimens of this class.

A kind of stove lately revived and commended by Dr. Arnott, for its smoke burning qualities, is an exception to the present general practice in regard to the height of the fire above the floor. This grate might, however, be rendered even more efficient in its heating powers, and its unsightly appearance obviated, if the coal box, which occupies the lower part and really causes the high position of the fire, were made to descend into the back hearth, where depth for the purpose may generally be obtained.

Previously to Count Rumford's improvements, various plans were suggested for modifying the construction of fire-places. The principal seem to have been directed to increasing the amount of radiation from the burning fuel. Sir John Winter's (1658), and Prince Rupert's (1678), are good examples. Perhaps the most scientific series of experiments was conducted by Cardinal Polignac, who, in addition to contrivances for increasing the amount of direct radiation, made use of reflectors to throw the heat into the apartment. His useful Treatise, "La Mechanique du Feu," Amsterdam, 1714, contains the following passage :—"It seems that those who have hitherto built, or caused chimneys to be built, have only taken care to contrive in the chambers certain places where wood may be burnt, without making a due reflection that the wood in burning ought to warm those chambers, and the persons who are in them." The first part of the treatise is devoted to the fire and the interior disposition of the front part of the fire-place for the purpose of augmenting the heat. It states that there are three ways in which the heat of the burning fuel is made effective for warming a room : by direct radiation, by reflection, and by conduction and transmission. Examples of fire-places are given, in which the quantity of radiated heat is increased by parabolic reflectors of iron or brass placed in the jambs of the fire-place. The second division treats of the interior disposition of the back part of the fire-place, and of using the conducting property of iron to transmit a portion of the otherwise lost heat of the fire and smoke to atmospheric air, the properties of which are considered well calculated for conveying heat from the surfaces of the metallic substances round the fire to distant parts of the room. Several fire-places are described, in which the back, jambs, and hearth, are made with hollow spaces, or caliducts, for the purpose of warming a copious supply of external air, afterwards admitted into the room by an opening controlled by a valve or regulator. The variety of modes in which this plan may be applied renders it extremely valuable. Adjoining rooms may be heated from one fire-place in the partition wall; for by making a fire in one room the heated air from the caliducts may be discharged into the other, or the warmed air may be conveyed to any of the upper rooms.

The Polignac fire-places were constructed for the consumption of wood fuel, but Dr. Desaguliers modified them so as to admit of coal being burnt. His fire-places were much appreciated for a time, but subsequently fell into disuse, from the supposition that they burnt the air. It is possible that the more intense combustion of a coal fire in a grate might give to the iron plates that formed the sides of the caliducts a higher temperature than they had in the Polignac fire-places, but with the large proportions which he gave to his air channels this result might be avoided.

Many contrivances similar in principle to Savot's (1626) and Polignac's grates, have been brought forward, and Dr. Franklin (1745) invented a stove known as the Pennsylvania stove, which combined, to some extent, the peculiarities of Polignac's arrangement with the descending flue in Prince Rupert's stove. The proportions of the caliducts, however, in Franklin's stove make it rather questionable whether it did not overheat the air. It is said of one of these stoves, which was adapted to burning coal, that it kept a room fourteen feet square at a temperature of from sixty to sixty-four degrees for thirteen hours, with a consumption of one peck of coals, the external temperature being twenty-eight degrees.

M. Peclet's work, "Traité de la Chaleur," chapter 13 contains descriptions of several fire-places for utilizing a portion of the heat which passes off with the smoke, by applying it to warm a supply of fresh air for the apartment.

It is possible to modify these arrangements in very many ways. The conditions to be observed are, to dispose the heated surfaces so that they may be efficacious, to give a sufficient area to the air ducts, and lastly, to render the tubes and the joints sufficiently tight, that the smoke may not mix with the warm air.

These treatises show the attention which the subject of the economy of fuel has received in other countries. It is probable, however, that in our own country there are few architects or scientific men, who have not themselves tried or seen the results of experiments conducted with the same object. It has occurred to some to increase the amount of effect derived from the combustion of fuel, in ordinary fire-places, by admitting the external air to an enclosed chamber at the back of the fire-place, where it becomes warmed by contact with the cheeks of the grate, and is then admitted into the apartment, through perforations in front of the grate. Where a spare flue exists in the chimney breast, the warm air may be conveyed through it, and discharged through an opening near the ceiling of the same apartment, or conveyed to an adjoining room, or to one on an upper floor.

An instance of the benefit derived from these or similar contrivances, though on a small scale, is worth mentioning. A building of only one story in height, in a very exposed situation, the flue from the fire-place having very little elevation, was constantly subject to smoke. The door opened directly into the open air, and on the same side there was a large window. When the fire was lighted, if the chimney drew at all, there were such currents of cold air from the crevices of the door and window, that the largest possible fire could not warm the room. The following remedy was applied:—An opening, fourteen inches by nine, was made in the external wall opposite to the fire-place, a little beneath the level of the floor joists. This communicated with the space under the floor boards. Beneath one of the jambs of the fire-place, a channel was formed communicating with a chamber on one side of the grate. The stove consisted of a fire grate and front bars, set in brickwork with splayed covings, leaving a triangular chamber in each corner, the one on the left being connected with the channel already described. Two pieces of square cast iron pipe, each four and a half by three inches, were fixed horizontally at the back of the fire, a fire-tile, two and a quarter inches thick, forming the back of the grate between them and the fuel. The ends of both pipes were open to the triangular chambers. From the top of the right hand chamber, a flue, nine inches by nine, in the chimney breast by the side of the smoke flue, opened into the room between the mantel-shelf and the ceiling. The cold air entering through the aperture in the external wall passed under the floor into the cold air chamber on the left of the fire-place, then through the iron tubes (by which it became warmed) into the warm air chamber on the right, and up the vertical flue into the room. The result was, that during extremely cold weather the temperature was raised to such a degree, that the external door was often left open when snow lay upon the ground; the chimney no longer smoked; instead of currents of cold air into the room, warm air passed out of it; and the ventilation was so good, that several persons smoking for an hour or two did not occasion any smoke to accumulate.

Air flues constructed in the chimney breasts, when a house is built, would materially promote the comfort of the inhabitants. These flues might have openings at bottom communicating with the external air, and if they were carried up alongside the smoke flues from the different fire-places, or connected with the void spaces round the grates, a considerable portion of the waste heat, usually escaping by the chimney, would be communicated to the air in the flues. Apertures should be made into them at their upper part to communicate with the various rooms, and a continuous supply of tempered air might thus be provided to maintain salutary ventilation, to supply the requisite quantity of air to the fires, and to afford an increased degree of warmth.

Chimney openings have not generally sufficient depth to receive grates of the most efficient kind. The practice of making the breasts project into the room, and the necessity for restricting the projection to the smallest limit, have led to the modern custom of making the recess of the chimney opening only a brick and a half in depth. If all the flues were built in the party-wall, no chimney breast would be required above a projection of a brick, or half a brick at the fire-place itself, which might be concealed by, or form part of the chimney-piece.

Where fire-places are situated in an external wall, the difficulty of providing a supply of air is not felt, as a hole may generally be made directly through the wall at the back; but as in town-houses they are generally formed in the party-walls, independent flues must be brought up for the purpose by the side of the chimney breasts, and openings cut through the jambs.

Where there are several stories, it would be difficult to supply air to the upper rooms, as the smoke flues from the lower rooms would generally interfere between the air flues and the fire-place. In some cases, an air flue might be formed in the floor by using the space between two joists in connection with a grating in the outer wall, and carrying an iron pipe, three or four inches in diameter, under the hearth through the trimmer and trimmer arch into the space behind the fire-place. This arrangement, however, requires the trimmer joists to be strengthened, and in London, the Building Act might probably prevent it, while the supply of air so obtained would be less than is desirable. It is, however, possible in most cases to make some arrangements for the supply of air; but it would be preferable that adequate provision should be made in all new houses, either by air flues in the party-walls, or by other modes which will suggest themselves to the architect.

Referring to Cardinal Polignac's statement as to the three modes in which the heat of burning fuel may be rendered serviceable for warming, viz., by radiation, by reflection, and by conduction; we have seen how they may be combined to produce an effect very different from that of the stoves to which Dr. Arnott's remarks applied.

By the use of fire-brick linings, and by placing the aperture for the escape of the smoke at the back of the fire, we increase the intensity of the combustion, and the consequent radiation.

By the use of reflecting surfaces, we ensure nearly all the radiated heat being directed into the room.

By placing the fire upon the hearth, and by properly arranging the conducting materials, we greatly increase the amount of radiation, and destroy the cold foot bath which accompanies a fire raised much above the floor; while by introducing warm air chambers and caliducts, we abstract a large portion of heat from the smoke, and employ it to warm a supply of fresh air for the room, which prevents cold chink winds, one of the principal objections against the open fire-place, and corrects the tendency to unequal heating which arises when we depend on radiated heat alone.

By diminishing the quantity of air escaping up the chimney, we reduce its liability to smoking.

By the use of sunk ash-pits or concealed ash-pans, in conjunction with low fires, we prevent the dust being diffused into the room.

As regards bad ventilation, it is by no means evident that this asserted objection to the open fire-place is correct, but granting that the fire-place ought not to be the only means, modern practice has given us numerous contrivances by which efficient ventilation may be obtained, while on the other hand it is certain that so long as we allow the fire to draw its supply of air from the room, we must have some ventilation. As much disappointment is often occasioned by the want of knowledge as to the points which constitute a good stove, the following remarks are offered in the hope that they may be found useful.

1. The fire should be as near the floor as possible.

2. The opening of the front should be low.

3. The grate should be lined with fire-brick.

4. A shallow fire with a large upper surface is better than much front with a contracted upper surface.

5. A stove from which the smoke escapes from the back is better than one from which it rises directly into the chimney.

6. A contrivance for regulating the quantity of air escaping up the chimney is very desirable.

7. The use of a blower in any form is only waste of fuel.

Guided by these rules, a purchaser would choose Sylvester's, Stephens', Wright's or Jobson's stoves before all others; while a combination of the reflecting surfaces of the body of Stephens' with the radiating hearth of Sylvester's makes the most efficient and economical stove that has yet been manufactured. Caliducts for heating the air may be applied to all these stoves at a small cost.

The stoves recommended are adapted for the principal apartments, but, as they are expensive, the bedchambers and inferior rooms may be provided with good register stoves.

In a register stove the fire should be fixed as low as possible, the top bar being not more than eleven inches from the hearth, and the opening in front not more than thirty inches wide, and of about the same height in an ordinary apartment.

The cheeks should be set at an angle of about 135 degrees with the back, and polished to make them better reflectors. The fire should not be more than six inches high, and eight and a half or nine inches deep from front to back; the back and sides being lined with fire-brick. Its projection should be confined within the line of the front when the products of combustion pass directly upwards; but when they escape through luffers, or a door at the back, the fire may be brought more forward, the limit being the danger of a cross draught if the projection exceeds three or four inches.

For plainer fire-places, nothing better can be used than the sham register front with fire-brick cheeks, on Count Rumford's plan.

The following rules for setting stoves may be found of service.

1st. To let no air enter the flue, except what passes through the opening provided for the escape of the smoke. If it be desired to have a ventilating opening into the flue from the upper part of the room, the propriety of forming it will depend upon the draught which ordinarily exists in the flue. It will generally be better to use an unoccupied flue for the purpose of ventilation.

2nd. The grate should be kept as much forward into the room as is consistent with appearance. It is a mistake to suppose that it is more likely to smoke when brought well forward than when pushed back into a recess, provided cross draughts are avoided.

3rd. The flue in common register stoves should be brought down of equal dimensions perpendicularly over the fire, the register contracting the opening at the bottom, or, where the escape of smoke is at the back, the flue should be brought down at the back of the grate, and be made perfectly air tight.

The gathering wings usually constructed over the openings of fire-places are perfectly useless.

In conclusion it may be remarked, that with the improvements introduced into modern grates, the heat afforded for the warming of a room ought materially to exceed the proportion stated by Dr. Arnott, whose observations seem to have been made upon stoves of an imperfect construction.

In answer to an enquiry, Mr. Rosser said that the Staffordshire grate was commonly used in road-side inns and farm-houses in the Midland Counties, without the accompaniment of a fender. The first impression of such a grate would be that the chimney *must* smoke, the whole of the fire being beyond and in advance of the flue, whereas he had never seen one which did smoke. The same thing might be seen in Sylvester's grate; and he presumed that the body of air in the room, pressing towards the aperture, deprived the smoke of its tendency to escape into the room, and thus forced it up the flue.

Mr. Scoles, Hon. Sec., observed that the success of this kind of grate was the more remarkable, as the fire was exposed to all kinds of cross draughts.

Mr. Rosser stated (in reply to the Chairman, Mr. T. L. Donaldson, H.S.F.C.), that if the grate receded instead of advancing, there would be far less radiation.

Mr. Baker, Associate, remarked that the Staffordshire grate was alluded to under the name of the Pot-house grate by Vernon, who suggested that a hood should be placed over the front of it, in order to reflect the heat into the room.

Mr. Scoles considered that a hood would prevent the pressure of the air adverted to by Mr. Rosser.

Mr. T. H. Wyatt, Fellow, referred to a grate in the office of Mr. Burn, Fellow, which was subject to a cold down draught, the supply of air for the fire being taken from outside the house.

Dr. Arnott, Visitor, observed that the subject was a very extensive and interesting one. The theory and principles of combustion were frequently quite opposite to the facts which occurred in the action of chimneys. He had no doubt that with some further study of the subject some of Mr. Rosser's opinions would become changed. With regard to low fires, it would be found by placing a thermometer on the floor, that a fire on the hearth did not dart a single ray of heat upon the carpet. The whole of the heat of a low fire would be found to ascend, and the feet of the people sitting in front of it became cold. Many of the opinions advanced on the subject of fire-places were no more true than the old opinions, that the sun rose and set instead of the earth turning round. M. Peclet, whom he had seen in Paris, had told him that the normal condition of all the chimneys in Paris was to smoke. The dearness of fuel caused the people there to keep their fires half smothered, and to shut the inside of the chimneys and let the smoke into the room. The smoke, indeed, was made so cold by the channels round the fire that the necessary intensity of ignition was prevented; so that less heat was obtained from the fire, and the smoke was so cold that the external atmosphere was not sufficient to make the chimney act. The tops of all the chimneys in Paris exhibited in a striking manner the distress of the inhabitants, by the great variety of cowls which ornamented them.

The Chairman inquired whether Dr. Arnott went so far as to say that the higher the fire was raised above the floor the warmer the room would be?

Dr. Arnott said within certain limits. He described the effect produced by substituting, in his own drawing-room, a low fire-place (the very best which a good ironmonger could supply) for one that was raised above the floor. He found with the low fire the cold affected his feet most severely. He considered a grate should be raised about fourteen inches from the floor.

Mr. Smith, Hon. Mem., observed that there was scarcely any subject which had been so much discussed, or upon which so many conflicting opinions were entertained, as on the question of warming domestic apartments. Even in the operation of stirring a fire, almost everybody considered his own plan the best. He referred to a grate in which the fire was made upon a polished iron hearth without any grating or aperture beneath to feed it, and the result was perfectly satisfactory; the fire drawing remarkably well, and giving out a very considerable heat. The same plan, however, had been tried, on his description of it, at another place where it had not answered at all. The cowl, as an appendage to the chimney shaft, was not peculiar to Paris. It was as common as possible in London, and even the chimneys of Buckingham Palace were not exempt from it. The horizontal shelf behind the Staffordshire grate he considered a very good contrivance. Most of the inns and many private houses in Yorkshire had a similar arrangement, the shelf holding a sufficient quantity of coals to last all day. Reasoning upon this arrangement, he had been induced in his own house to adopt the plan of warming the coals beneath the grate before placing them upon the fire, and he found the combustion more perfect, and the smoke much less in consequence. His fire-place was upon a plan of his own,—the front of the bars being in a line with the front of the chimney-piece, and therefore in advance of the walls of the room. This grate drew exceedingly well, but was liable to disturbance from cross draughts.

Dr. Arnott assented to the importance of warming the fuel before placing it on the fire.

Mr. T. H. Wyatt referred to a case in which smoky chimneys had been caused to a great extent by the defective pointing of the brickwork of a large stack of chimneys. He had rebuilt these chimneys, forming the part above the roof with hollow bricks, which he found had a very good effect.

Mr. Nash, Associate, stated that in his own practice he had introduced cold air at the hearth, and found it to cure a smoky chimney. It might be thought that the introduction in this way of air that had not been previously warmed would be inconvenient, but he had not found it so. Even if the quantity of air so introduced was very great indeed, he found, on opening a window at the top, that the air instead of coming in was going out; the fire rarefying the air so much that it overbalanced the indraught at the window. He had adopted this plan with complete success in a room, the chimney of which had previously smoked. He introduced the air exactly in front of the fire by two perforated copper boxes, or in other cases by a grating with a large air chamber under the hearth; though the latter plan was rather objectionable, inasmuch as it became in some degree an ash-pit.

The Chairman sketched and described a grate in his own dining-room, constructed by Mr. Cundy. It had a back of fire-brick inclined forwards. The air was brought from outside the room through a channel and escaped immediately under the grate. The heat given out was considerable, and the room, though spacious, was perfectly warmed.

Mr. Baker mentioned a case in which he had adopted one of the Farnley Company's fire-brick fire-places in the shape of a niche. The hearth, which was of fire-brick, was raised three inches above the floor; cold air was admitted underneath. The fire-place was made upon Leslie's principle, without any false front. The fire-brick consumed the smoke that was generated; but he found it was necessary to keep the hood thrown back, in order that the smoke might pass up the chimney. This stove, which was twenty-two inches wide, warmed perfectly a room of forty feet by twenty-four. The fire-brick itself was not however a satisfactory specimen.

Mr. Nash, Associate, confirmed Mr. Baker's statement as to the heat given out by the Farnley stoves, which he had seen used in Yorkshire. The fire-brick getting hot, the heat was powerfully radiated into the room from the dome.

The Chairman moved the thanks of the meeting to Mr. Rosser, which was unanimously agreed to, and the meeting then adjourned.

ON THE RESTORATION AND PRESERVATION OF WOOD CARVINGS.

A Communication from Henry Crace, Esq.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, April 28th 1856.

Being much interested in the preservation of the various beautiful carvings of this country, more particularly those of the seventeenth century, I have considered that it might be of use to the Members of the Institute, to submit for their inspection a specimen of some I have lately restored for the Worshipful Company of Mercers, in their Hall, which was rebuilt after the Fire of London, in 1666. These carvings having gone completely to decay, I was requested by the late Master, William Barnes, Esq., a Member of your Institute, to examine and report what I could do to restore and preserve them. I found the whole had been removed out of the Hall, the architect fearing they might fall from the panelling, as they were worm-eaten in parts into perfect dust, and principally kept together by the large quantity of paint, varnish, &c, they had received from time to time. The piece of carving I have placed on the table I have obtained permission of the Company to take down for your inspection. Had I contemplated submitting it to the Institute, I would have done so before I restored all the panels, that a more correct idea might be formed of their actual state of decay. I have, however, obtained a small piece of one of the leaves which Mr. Eugene Barnes, Clerk to the Company, had preserved, and placed under a shade to show the perfect honeycomb the wood had been reduced to when the dust was blown out; also a portion of dust in a bottle—the work of the insects which had destroyed the wood. The main stem being of deal, the fruit, flowers, &c., are of lime, pear, and beech. The leaf of pear-wood I have partly cleaned, to show the Court of the Mercers' Company that had the carvings been more perfect and wholly of oak, or any one wood, I could have restored them to their primitive colour and freshness.

It may now be necessary to explain what has been done to it. The carving is of the same colour as when taken down. I merely washed it, and with a gimblet bored a number of holes in the back, and into every projecting piece of fruit, and leaves, on the face, and placing the whole in a long trough 15 inches deep, I covered it with a solution prepared in the following manner:—I took 16 gallons of linseed oil with 2lbs. of litharge finely ground, 1lb. of camphor, and 2lb. of red lead, which I boiled for six hours, keeping it stirred that every ingredient might be perfectly incorporated. I then dissolved 6lbs. of bees' wax in a gallon of spirits of turpentine, and mixed the whole while warm thoroughly together.

In this solution the carving remained for twenty-four hours. When taken out, I kept the face downwards that the oil in the holes might soak down to the face of the carving, and on cutting some of the wood nearly 9 inches deep I found it had soaked through; for I should observe that not any of the dust was blown out, as I considered it a valuable medium to form a substance for the future support of the wood; this has been accomplished, and as the dust became saturated with the oil, it increased in bulk, and rendered the carving perfectly solid.

Each panel has consumed a little more than a gallon of the solution; they have been finished about five months, are becoming quite hard, and in the space of four or five years will be as hard as any wood. I have no doubt that in twenty years they will become so hard that no knife will cut them. Every gentleman present is aware that common putty becomes so hard within that period, that in hacking out a broken square of glass the wood is frequently destroyed, the putty being harder than the wood.

In my case the ingredients used will become more quickly hard, and I am confident that the carving is now more durable than the hour it left the carver's hands. The holes made by the gimlet are left open, that the air may penetrate to assist in the solidifying of the decayed parts of the wood, at the same time we are aware that no insect can enter it, and it is impossible for any such to subsist on the composition introduced.

As a further proof of the perfect restoration I may state, that the piece of carving now on the table, while being carried by myself and a workman across the room, fell of itself from our hands and was broken into twenty-two pieces, which, however, being mounted on a back-board, the whole was restored to its original features. There are ten panels now been mounted on boards of a similar description, which, having been soaked in the solution, and profiled out and painted to match the oak panelling, the addition is not observed.

With reference to the cleaning and restoring of old carvings, I can state that my experience ranges over a period of fifty years, having commenced in the restoration of the very handsome wards of Greenwich Hospital.

Before that period it was the fashion to wash the oak compartments and varnish them, by which process, and with time and filth, they had become perfectly black, or rather of a chocolate colour. We set to work to clean them, and at last succeeded in bringing them back to their original freshness; and I believe that during that period my father had the works, and afterwards my brother and myself, every ward fitted up with oak was restored.

A more perfect restoration and cleansing on a larger scale, took place in the Brewers' Hall, Addle Street. I was sent for by the late Mr. Hanbury, to ascertain the expense of painting and graining their Hall, in imitation of oak, varnished. I found their beautiful Hall of oak one mass of dirt, the mouldings and carvings having been nearly filled up and painted old oak colour; by repeated varnishings with boiled oil, it had become the colour of chocolate, and being lighted by small windows it had the appearance of a dingy vault or cavern. The architecture is Corinthian, with the columns, cornices and shields, in wainscot. It then became a question of expense, and after consulting with the late Mr. Pocock, their architect, I agreed to restore the whole of the Hall to its original colour, with varnishing, for the same amount as it cost to paint, grain as oak, and varnish it. This was done much to their satisfaction, and afterwards led the Company to have their Court Room, &c., cleaned in the same manner. Among many others I also restored some very fine old oak panelling which had been painted white and gilt, at Gilston Park, and at other seats of the nobility who possessed carvings of a similar description. I have also restored and preserved old carvings and furniture which had become worm-eaten by the same process, previously to re-gilding them.

The CHAIRMAN (Mr. F. C. PENROSE, V.P.) mentioned a case in which some carving that had been much worm eaten was preserved from further injury by dropping corrosive sublimate, by means of a pin point, into all the holes.

Mr. CRACE observed that in some of the specimens before the meeting there was only a single hole in one piece of fruit, yet the whole of the interior substance was converted into powder, and the mischief could not therefore be remedied by the use of a pin point. Mr Crace illustrated by percussion the soundness to which the carvings had been restored. He had not painted them, but they had been painted at an earlier period, and consisted of different kinds of wood. The greater part of the bulk of the bottom was deal. The lime tree wood had suffered very much, the oak was materially injured but not so much as the lime, whereas the deal had suffered more than either. One portion of pear tree had not been touched by the insect at all. It had been impossible to restore the original sharpness of the carvings, as if the varnish and paint had been removed they would have fallen to pieces. The insect which had committed these ravages was a small brown beetle about the size of a pin's head.

Mr. Jennings, Fellow, considered that the beetle was the perfect form of the worm, which was in reality the eating insect. He had seen it in both conditions, and believed it did not pass through any intermediate chrysalis state.

Mr. C. H. Smith, Hon. Member, observed that the insect which was so destructive to ship timber was unquestionably a worm, but in the present instance he believed it was the small beetle described by Mr Crace, being similar (except in size) to the wood louse and the cockchafer.

Mr. Crace stated that the same insect was very injurious to apple trees, rose trees, and sycamore trees, and mentioned a case in which two acres of rose trees had been attacked by it.

Mr. Smith added that the sapwood of the sycamores and limes in the Piccadilly and in the Regent's Park are affected by its ravages. It would generally be found that the sap wood of deal was greatly eaten, whilst the heart wood, which was full of turpentine, was untouched. The process described by Mr. Crace, resembled the natural condition, and it was obvious that the insects would avoid the wax, oil, and turpentine employed in it. If such a preparation could be injected into new carvings, he thought they would be exceedingly durable.

In further explanation Mr. Crace stated that the preparation would necessarily darken the wood, in the same way as ordinary boiled oil did, and that the red lead which was boiled with the oil prevented the possibility of any insect living in it.

Mr. Jennings said that the injury sustained by picture panels proved that the mere application of oil was not a sufficient protection. Oil being rather thicker than corrosive sublimate was more likely to interfere with the sharpness of delicate carvings.

The Chairman observed that corrosive sublimate was liable to wash out.

Mr. Scoles, Hon. Secretary, stated that ships used for carrying oil, and becoming saturated with it, were not subject to the worm.

Mr. G. Foggo, Visitor, observed that turpentine was found a complete protection for picture panels, and that the combination of oil and turpentine was the best vehicle for the use of the artist.

Mr. Nelson, Hon. Secretary, called attention to the actual conversion of a fine powder into a solid mass by Mr. Crace's method. He doubted whether corrosive sublimate would produce a similar effect.

The thanks of the meeting were unanimously voted to Mr. Crace for his communication.

Mr. Nelson, Hon. Sec. read a brief description of a Patent Iron Beam invented by Mr. R. M'Connel.

In making a flooring beam according to this invention, two thin bars or plates of malleable iron are used as the top and bottom plates of the beam. These two plates or bars are disposed parallel to each other, and at considerable distances asunder—one foot, for example, more or less, according to circumstances. This dimension would suffice for a bearing of twenty feet. The space between these plates is filled in with short blocks of wood, disposed with slight spaces between each block, for the reception of the flooring joists. These blocks, or pieces of wood, are disposed with the fibre of the wood in a vertical position; that is to say, in the direction in which the wood grows. When so packed in with wood, the two plates are bolted together at suitable intervals asunder by bolts, so as to bind the whole of the details into one solid beam. The wood having no appreciable shrinkage in the direction of its fibres, the beam always remains solid, whilst the direction in which the fibres are opposed to the strain from the flooring is most favourable in point of resisting strength. Cast-iron may be used instead of malleable plates for the top and bottom portions of the beam; or one plate may be of cast-iron, and the other of malleable iron. In a slight modification of this arrangement of beam, cast or malleable iron distending pieces may be used for interposition between the two main plates. When the two main plates are of malleable iron, open diagonal or other shaped castings may be used as the supporting or distending blocks, these castings being bolted up into position just as in the case of the wood blocks. Instead of being separate and detached blocks, the distending or stay pieces may be cast as projections upon one of the main plates or bars, the other plate being then bolted up. In any of these modifications, the main plates need not necessarily be parallel, as by using deeper blocks or stays towards the longitudinal centre of the beam, increased strength is secured. The top plate, too, may be in two or more lengths, with the junction ends abutting, or nearly so. A central key may then be driven in horizontally between these ends, so as to give a rise to the beam's central portion.

The cast-iron columns supporting the beam are formed with the usual neck and shoulder. The beam is attached to the wings or bracket arms of box or saddle pieces, which are passed upon the necks of the columns, and rest upon the shoulders. It is not necessary, however, to bolt or fix the beam or girder to the walls or to columns, as they may be made to simply rest with their ends in or upon the walls, or upon shoulders, or resting surfaces, formed upon the columns. A washer of an improved form is used in bolting together the pieces of timber, and it is designed to prevent the loosening of the bolt from shrinkage in the wood. The washer is in the form of a truncated cone, with an oval base, the narrow end of the cone being entered into a recess formed in the wood; so that when the wood shrinks, as it does across its breadth and thickness, it does not leave the washer, as in the case of the common flat washer, but merely clips it at a point a little nearer to its narrow end.

Mr. Papworth, Fellow, observed that the principle of the beam described was similar to that adopted in many old timber roofs, and had been applied by the late Mr. Thomas Cubitt to a roof of 100 ft. span.

The Chairman regretted that Mr. Donaldson was absent, as some further explanation was desirable. The beam at first sight appeared rather uncertain and treacherous, but it was quite a matter to be determined by experience.

Mr. Baker, Associate, thought the beam in question bore a strong resemblance to Warren's girder bridge. The latter, however, was lighter, triangles were used instead of squares, and there was more open space than in the beam described. Warren's bridge had been discussed and commended at the Institution of Civil Engineers.

Mr. Nelson read an extract from a letter sent to Mr. Donaldson, H.S.F.C., from Mr. Salmon, of Glasgow:—"With regard to beam, the drawings sent represent the manner in which it is executed in the iron building you and I visited. I think the arrangement for joist apertures or spaces might be improved, and a more equal strength imparted to the beam by scarfing the joists where they require to be joined, instead of passing the one beyond the other, and bolting them, as shewn by drawing. Other improvements might also be introduced." Mr. Nelson thought there must be some fallacy in the principle of making the lower portion of the beam, which was exposed to tension, of cast iron.

Mr. Papworth said he should not be surprised to find in practice that, if the upper tie were cambered by bolts, when it came to its bearing it would tear them all out.

The Chairman.—There is one subject, before I announce the adjournment of the meeting, which it is very desirable I should bring before you. It is with respect to the Annual General Meeting of the members, which is to take place on Monday next. It has for some years past happened that these annual meetings to transact the business of the Institute have been very thinly attended; and I think it is a very unfortunate state of things, because those who do come do not feel that energy and enthusiasm in transacting the business, which they would if the members showed themselves more interested in the matter. I would therefore beg that those who are now here and will not be withheld by absolute business, to attend themselves, and to ask those they may see to attend also on Monday next, because there are always subjects of importance to discuss which it is very unsatisfactory to consider at meetings so small as those which we have sometimes had.

After the ballot for the election of members the meeting adjourned.

ON THE BRIDGES AND VIADUCTS OF THE PRESENT DAY.

By John Clayton, Associate.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, May 19th, 1856.

There are few public works (commercially speaking at least) of greater interest or importance than bridges and viaducts. The necessity of good roads of communication from one part of a country to another, and the impossibility of completing them without erecting bridges over streams and viaducts over valleys, have given rise not only to the works of the present day, but also to those stupendous monuments of antiquity which have been handed down to us. With the magnificent bridges, viaducts, and aqueducts of the Romans every architect must be well acquainted, and it is indeed not long since that ancient Roman roads and modern British railways were compared by a very able authority before this Institute. In consequence of the immense extension of the railway system during the last thirty years, a more extensive field of bridge building has been opened than at any previous period. The fact that in 1852 fifteen thousand miles of railway had been constructed in Great Britain alone, and that these required, on an average, three or four bridges per mile, will give a total of fifty thousand bridges, large and small.

In speaking of the bridges and viaducts of the present day, it will be hardly necessary to observe that their great and striking peculiarity is to be found in the use of iron; and though, as architects, we may be impressed with the superior dignity and proportions of stone bridges, it must be granted that iron has many advantages compared with either stone or timber, as it is much lighter and more economical in the first outlay than the former, and more durable than the latter. It must not, however, be forgotton that, although iron construction may be considered the great invention and distinguishing peculiarity of modern times, there are also some very fine works in stone, brick, and timber. In the two former, however, no progress, worthy of peculiar notice, has been made, bridges of larger span having been executed by the Romans centuries ago. The largest span in stone, executed in England, is that over the Dee of 200 feet; but ancient examples are recorded to have been from 50 to 100 feet wider, which, with reference to the age when they were executed, must have called for a comparatively greater amount of skill. It is in iron therefore, with respect to the span, that the great merit of modern works consists; the changes in the different modes of applying this material have been gradual and progressive, and very similar to, though somewhat more rapid than, the changes in the different styles of architecture. The first iron bridge was erected about eighty years ago, and partook of the character of its predecessors in stone, being formed of cast iron voussoirs or wedge shaped blocks put together in ribs. From that time to the present there has not been much improvement in the construction of this class of iron bridges, and the span has only increased from 200 to 240 feet, which would appear to be the proper limit. Soon after the introduction of the cast voussoir principle, cast iron beams were used for small spans of 50 feet, which eventually, by combination with wrought iron trussing, reached as far as 100 feet. The greatest improvement was the formation of girders entirely of wrought iron, which soon followed the production of rolled plates and bars of different forms and sections. This in a few years led to the execution of spans of 460 feet, the largest of rigid roadways with a level headway beneath, yet constructed. In suspension bridges, spans on this principle have been executed of upwards of 1000 feet. But as these, from their vibration, are quite unfit for the passage of heavy weights in rapid motion, they will not be treated on the present occasion.

Cast iron bridges may be classed as follows:—*The arched rib, the trabeated, and the combination* *girder*. Wrought iron bridges consist of *the tubular girder*, *the tubular bow girder*, *the large tube*, and *lattice girders*, with several varieties of combination.

The first iron bridge constructed in England is that over the river Severn near to *Colebrook Dale*. The design appears to have originated with Mr. Pritchard, Architect, about the year 1773, and the works were completed in 1779. In this bridge five arched ribs of cast iron support perpendicular spandril pieces, which carry the roadway. The ribs are nearly semicircular and have a span of 100 feet.

Sunderland Bridge, over the River Wear, the next cast iron bridge erected, was designed by Mr. Rowland Burdon in 1792, to whom a patent was also granted, for "a certain mode or manner of making, uniting and applying cast iron blocks to be substituted in lieu of key stones in the construction of arches. This bridge consists of six arched ribs of a segmental form 200 feet span and 30 feet rise. Each rib is 5 feet deep and consists of 105 separate blocks.

Buildwas Bridge over the River Severn, by Telford, is like the foregoing a single arch, 130 feet span with 27 feet rise. It consists of three arched ribs 3 feet 10″ deep.

Boston Bridge, by Rennie, is remarkable for the slightness of its rise, which is 4 feet with a span of 100 feet.

Southwark Bridge, also by Rennie, has the greatest span executed, that of the centre arch being 240 and of the sides 210 feet. The rise of the centre arch is 24 feet, that of the side arches proportionate. The arches consist each of eight ribs 8 feet deep at the springing and 6 feet at the crown. Each rib is cast in fifteen pieces of much larger masses than in the previous works.

The New Bridge, Westminster, in course of construction, will also prove a valuable addition to this class of works.

Upon simple cast iron beams it will not be necessary to say much. The first application of this material as a beam is due to Boulton and Watt, after whom it was extensively applied in construction by Sir R. Smirke. Although useful in buildings, its fragile and treacherous character renders it hazardous for railway purposes. Capable of bearing a large amount of dead weight it can be easily broken by a cross blow or the sudden shock of a passing train. Its span has reached 40 or 45 feet, and this only under very careful treatment.

With the view of remedying the defects of cast iron girders, recourse was had to trussing them with malleable iron. Owing, however, to the unequal expansion and contraction of the two metals, and the fact that the two were seldom brought into action at the same time, the success of these beams has been very doubtful. They have been used in spans of 50 to 100 feet, but certain failures appear to have led to their disuse.

Lea Bridge was erected about ten years ago, the total length is 70 feet or 66 feet clear bearing. The girder is composed of two castings of an uniform depth of 3 feet, bolted together with wrought plates to the joints and trussing bars.

Dee Bridge, Chester, was the largest bridge of the kind; it crossed the river in three spans and had a double line of rails with a pair of girders to each. The total length of each girder was 109 feet or 98 feet clear bearing. It had an uniform depth of 3 feet 9, and was formed of three separate castings. Cast iron plates 13 feet long and 3 feet deep were bolted over the top of the joints, and a set of trussing bars was placed on each side of the girder. The thickness of the web or central part was $2\frac{1}{8}''$, the top flange 7″ wide, the bottom 2 feet. The girders sustained the usual test yet gave way under a much less load. The failure has been attributed to a variety of causes, but a not unfrequent one has been overlooked, viz., the manner in which the roadway was made to take its bearing on the girders. As a general rule, too much care cannot be taken to give the weight an uniform bearing in a vertical direction on either cast or wrought iron girders, more especially the former. Placing the planking or beams on the inside flange will, on the passage of every weight, cause a tilting vibratory motion; if the roadway cannot be placed altogether on the top of the girder, it should be carried underneath it and suspended with plates and bolts.

Tubular Girder Bridges owe their origin to the manufacture of wrought plate iron, which was first used in ship building. Great improvements were soon made in the mode of joining and rivetting these plates, and the T, L, and double L iron, manufactured by Mr. Fairbairn, led to the great works which were carried out after its application to railway purposes.

The Liverpool Canal Bridge, on the Blackburn and Bolton Railway, executed by Mr. Fairbairn, was the first application of these girders; the span is 60 feet. *The Liverpool Landing Stage Bridge*, erected by Mr. Fairbairn for Sir W. Cubitt, spans the space between the pier and the floating pontoon in deep water. Its total length is 152 feet, and 142 feet between bearings.

The Gainsborough Bridge, erected by Messrs. Fairbairn for Mr. Fowler, crosses the river Trent at the angle of 50°. It consists of two spans each of 154 feet. There are two girders to each span carrying a double line of rails; the girders are of an uniform depth of 12 feet; the top is strengthened by a double chamber 3 feet wide by 1 foot 3 deep; the width of the girder below is 2 feet 6. The sides of the girder are strengthened by an arched rib of a double L shape, 1 foot deep; the plates are 2 feet wide and ½ an inch thick.

The Britannia Bridge, by Stephenson, has been fully described, and it is only necessary to give *chief* dimensions. It consists of four spans, the two main 460 feet, the two side 230 feet, and it is 90 feet clear of high water mark. There is a tubular girder to each line of rails, the dimensions of which are 30 by 14 feet 6. The form of this tube is square and it is stiffened at the top and bottom by small cells, which answer to the top and bottom chords of the lattice girder.

The High Level Bridge, Newcastle, also by Stephenson, forms a junction between several railways. It is remarkable for carrying a railway above and a roadway for street traffic below, and consists of six spans of 125 feet; the extreme height is 125 feet, and there is a clear opening of 80 feet above the water line. The weight is carried by arches on the level of the roadway, the bottom of which is suspended from it. The piers measure 50 by 16 feet, and are lightened by arches. The most striking and peculiar feature is seen from the roadway, which presents a series of dark arched ribs, with light bursting through the bars supporting the sides. The whole design is exceedingly good and the exterior handsome.

Before entering upon the subject of *lattice girder bridges*, it is necessary to glance at the timber viaducts, as it is from them that they derived their origin.

The most remarkable of these structures are American. The greatest span is that over *the Portsmouth river*, 250 feet; the greatest height that over *Genesse river*, 230 feet. As English examples we may mention—*Dinting Vale* with a span 120 by 125 feet, *Landore* 109 by 90. Amongst the earliest wooden bridges are those designed by Palladio, three of which have 100 feet span, two are framed on the ordinary principle of trussing, and the other on the arched rib or voussoir principle.

The Portsmouth River Bridge is formed on the same principle as the last, with the addition of diagonal bracing to each voussoir. *Don Bridge* near Aberdeen, is composed of a strong arched rib, in the spandrils between which and the level roadway above, is a filling in of framing distributing the pressure. *Schaffhausen Bridge* is similar in arrangement to the earliest American. The weight is carried by a series of raking struts, which radiate from one or more points on piers or abutments; they are bolted to the top and bottom chords of the girder, and transfer the weight of the roadway at regular intervals to the piers.

The Portage Timber Viaduct, the loftiest and most interesting piece of timber work of the kind, crosses the Genesse river at an altitude of 230 feet. This work, designed by Mr. Silas Seymour, was commenced on the 1st of July, 1851, and completed in a period of only thirteen months and a half. The whole length is 800 feet, the piers, 50 feet apart, are formed of wooden trestles standing on a base of stone 24 feet high. The trestles are formed of timbers 14 inches square at the base and 1 foot at the top, the braces to the piers and girders are 6″ by 12″, the number of vertical posts at the base are twenty-one, which diminish to fifteen at the top. Three rows of girders, 14 feet deep, formed of diagonal braces, support the roadway. The cost of the bridge was £35,000., the quantity of timber 135,500 feet. It was estimated that a stone bridge would have cost seven times the amount, and that the interest would renew the whole three times as often as would be required. This may apply in America, but the economy of using timber is very questionable in England.

My own professional engagement in the locality enables me to enter more at length into the description of the *Crumlin Viaduct* situated on the Newport, Abergavenny, and Hereford Railway Extension, which with the exception of the *Aqueduct of Spoleto* and the *Portage Timber Viaduct* in the United States, exceeds any other structure of the kind in height. It is a remarkable example of the modern application of iron to such purposes. The dimensions are as follow:—Total height from the bed of the river to the level of the rails, 200 feet; the piers from centre to centre, 150 feet; actual bearing of girder, 148 feet; the total length of viaduct, 600 yards. There are altogether ten spans or openings, but they are unequally divided by a tongue of land on which are placed masonry and earthwork, about 50 yards in length, making in reality, as far as the ironwork is concerned, two separate viaducts. The larger viaduct has seven spans and six piers; the smaller one, three spans and two piers. Excepting the height of the piers from the level of the valley, the two are precisely similar, and it will be necessary only to allude to the larger one. The piers are formed of clusters of cast iron columns, placed in stages. Each column is 17 feet long by 1 foot in diameter; cast hollow, the thickness of metal varying from 1 inch to $\frac{7}{8}$, diminished within, the same external diameter and form of column being preserved throughout. The number of columns in each stage is fourteen, and they are arranged on plan, in the longer direction, in four rows of three each, with one standing singly at each end of the piers, which gives it a salient angular outline. The width between the columns at the base of the pier measures 13 feet 6 in every direction, taken on the square, excepting between the two centre rows, where it measures six feet throughout the height. The pier gradually diminishes to the top of the columns below the girders, where the dimension 13 feet 6 is reduced to 9 feet, and at the external angle columns to 2 feet. The dimensions of the piers at the base are between the centres of the columns 60 by 27 feet, and the upper dimensions 30 by 18 feet, giving a diminution of 30 feet in one direction and of 9 feet in the other. To effect this, nearly all the columns are more or less inclined, and the two centre are the only upright ones. The four columns at the corners, forming the square of the piers, lean diagonally 4 feet 6. The six intermediate columns correspond, but lean each in one direction only. The two single outside columns are most inclined, being 11 feet 6 out of the perpendicular, forming a raking brace. The top of each stage of columns is connected by horizontal cast girders 1 foot deep, with 5 inch flanges, bolted together. There are also horizontal and vertical wrought tie rods. The former are circular, and 2in. diameter, and the latter flat bars, 4 × $\frac{3}{4}$. They are tightened with wedges where necessary. The columns are fitted together with socket joints, a projection of half an inch being left on the top of the cap, which fits into the base of the column above. These are held together by four ears cast on the top and bottom, which are fixed with bolts and nuts. The joints of the columns are planed and fitted together with the greatest nicety to ensure a perfect bearing. The base plates upon which the columns stand vary from 3 feet to 5 feet in height, and have a plate 3 feet square resting on the masonry, into which they are joggled, plugged, bolted, and put together with sulphur joints. The number of stages of columns to centre piers, it will be perceived, are ten, without base plates. The upper stages of the columns are connected together at top by stronger horizontal girders than those below. They are finished with A shaped or triangular trusses placed over each row of columns below, upon which the girders rest. It should be mentioned that the foundations for the piers are formed of solid, flat bedded and jointed masonry; they were generally carried down to the solid rock, and vary from 10 to 3 feet in depth. The largest blocks are placed immediately under the base of the columns and so arranged as to distribute the weight below as much as possible. The girders are formed of wrought iron after Warren's patent. This consists of a stout beam above, and a bottom tie below, with diagonal filling in, the whole being supported by the top beam on the principle of an inverted truss, the mode of execution, however, differs much. The girders at the Crumlin are 150 feet long and 14 feet 6 deep, outside dimensions. The dimension of the top tubular beam is $14\frac{1}{2}$ inches by 9; the average thickness of the plates being, the sides an inch, the top and bottom half an inch. The sides have flanges formed on the edges, which are rivetted to the top and bottom plate. Extra stiffening pieces are carried along the bottom, and likewise the joints and where the bolts cross. The ties at the bottom of the diagonals of the girder are formed of a series of four wrought bars, 6″ by $\frac{5}{8}$″ average, placed in pairs 3 inches apart in the centre to admit the diagonals and packing, and shewing a 4 inch separation on face; the whole forming a square combination measuring 16 inches by 7; these bars reach from diagonal to diagonal, where they are all four joined with a plate 16 inches deep, and bolted with five $\frac{7}{8}$ rivets to each. There are eighteen diagonals to each girder, which act as struts and ties until they gradually approach the centre, where they act as both. The diagonals do not cross each other, as is the case in the lattice girder, but are both fixed to the top beam and bottom tie with large bolts $3\frac{1}{2}$ inches diameter; and it is on the care and security with which these parts are connected that the chief strength of the girders depends. The diagonal ties and struts present a different section, the main strut being of a cross shape, measuring 10 inches to each extremity, cut out of $\frac{7}{8}$ plates, with four 5 inch L angle pieces rivetted. The ties are formed of two flat iron bars 9″ by $\frac{1}{2}$″, which lap the struts, where they are rivetted, top and bottom. The ties near the centre, extending two on each side, are strengthened by smaller pieces of T iron, to enable them to act in some measure in the double capacity of ties and struts. The part of the lower beam or ties between the four centre strains of diagonals is strengthened by an additional bar 4″ wide, filling the space between the other bars, and rivetted like them to the junction plates. The whole girder is gradually strengthened by an additional thickness of plates towards the centre, given by a close calculation of the forces required to be resisted. The side plates of the girder and ties diminish from 1 inch in the centre to $\frac{5}{8}$ at the ends. Each pair of girders is connected at each of the large bolts or pins with a 5″ cast iron hollow bar, with $\frac{1}{2}$″ thickness of metal. The bolts are passed through the ties, diagonals, and packing pieces, leaving the heads outside, the ends of the pin projecting about an inch; the end is then covered with a cast iron cap, which is screwed or bolted with a $1\frac{1}{2}$″ screw into the centre of the pin, to prevent the same from drawing out. This affords a means of connection with the cast iron bars by corresponding flanges, which are firmly bolted together. The bearing of the girder, by which the whole is sustained, is worthy of particular notice. It is held by the ends of the *upper beam only*, the lower one dropping in a state of suspension; the weight thus entirely rests on the last pin, which passes through the outside diagonal tie. The top of the angular termination of the piers is furnished with a casting 3 feet 6 long and 5 inches wide, on the upper surface of which is a flat sinking $\frac{3}{4}$″ deep. Under the ends of the upper beam are placed cast iron blocks, hollowed out on the upper surface to receive half the diameter of the pin, and of sufficient depth to raise the bottom flanges of the beam clear of the sliding groove. This block has perfect freedom of play backwards and forwards to suit the expansion and contraction of the girders as affected by the temperature of the atmosphere or the superincumbent weight; for this purpose a space of 9 inches is likewise left clear between the ends of the beams. The ordinary expansion and contraction in summer, between midday and midnight does not exceed a quarter of an inch. The girders have been tested with a weight of 250 tons each, which produced a very slight deflection; and were the viaduct loaded with locomotives this would be seven or eight times as much as could be put upon them. The struts have also been tested with a crushing weight of 250 tons. The roadway is formed of 6 inch planking bolted to the beams, and it is intended that the rails should be laid on strong longitudinal framed sleepers. An ornamental cast iron balustrade is fixed on each side of roadway. The whole viaduct is not straight on the plan, the approaches to the larger one being curved, to which the last spans of the viaduct accommodate themselves by a slight inclination southwards at the extremities. This viaduct has been described as one of the engineering wonders of the day, and it may be mentioned, that another projected by the same engineers, is of a much greater height. Messrs. Liddell and Gordon, were the Engineers; Mr. M. W. Carr, the Resident Engineer; Messrs Kennard, the Contractors.

The *Sitter Viaduct*, on the St. Gall and Appenzel Railway, an account of the completion of which has just appeared, is one of similar construction except that the girders are lattice. It is close upon the same height and has four spans, the two centre being 138 feet, and the two side ones 130 feet, but on the whole is a work of less magnitude than the Crumlin.

The *Newark Dyke Bridge*, crosses in one span a branch of the Trent at an angle so oblique as to render it necessary that the girder should be 240 feet 6 long, whilst the width measured on the square between the abutments is only 97 feet 6. This is also one of Warren's patent, but differs materially from the Crumlin, inasmuch as the top tube and the parts compressed are of cast iron. Each line is carried by a pair of girders 13 feet apart, between which the trains run. The top tube or strut is composed of twenty-nine cast iron pipes 13 inches diameter, the thickness of metal 1½ inch. The ends of these are turned and nicely fitted together and bolted; the cast iron struts are of the form of a Maltese cross. Each girder weighs 122 tons 10 cwt., the whole bridge, including the platform, 589 tons. The deflection caused by two heavy goods engines travelling both fast and slow (60 tons weight) was 2⅛ inches. This bridge was erected before the Crumlin, and although the span is greater, the preference must be given to the latter as being composed entirely of wrought iron.

Chepstow Bridge, over the River Wye, by Mr. Brunel, is a remarkable example of the combination of the tube and girder, to which may be added a third principle, that of suspension. The whole length of the bridge is 623 feet, one half of which is crossed by a viaduct girder of three spans, the remaining portion by a single span of 296 feet. The central pier is composed of six cast iron cylinders 8 feet diameter below, placed in two rows of three each, the viaduct piers are in single rows of three in each. Two girders, of uniform depth throughout, carry each line of rails, those above the roadway are perfectly distinct and do not depend upon each other. 50 feet above the large span a circular tube 9 feet diameter is placed, from which the roadway to each is suspended. This is done by two vertical frames of wrought iron, dividing the girder into three spaces, the centre the widest, the spaces braced with cross chains put together in links similar to suspension bars. The main chains hang from the tube at the ends over the pier to the opposite corner at the level of the roadway, where they are joined across the centre on both sides of the girder, and the middle space is crossed by chains both ways, which give additional security to the centre of the girder. The tubes are carried at each end on seventeen rollers, 5″ diameter, which allow for expansion and contraction;

the diameter of the pins which carry the leading chains is 7 inches. The girders are formed of single wrought plates, with top angular casing 3 feet wide, and a curved bottom flange. This girder is made strong enough for the 100 feet spans; and over the space three times that width, it will be perceived that it is supported in two intermediate parts, so that in reality the girder has very nearly the same bearing throughout. This is an extremely ingenious arrangement, the sectional quantity of material used with reference to the span being less than in any like structure. But it is to be regretted that from its want of symmetry and its lop-sided appearance, it is by no means an agreeable design. The *Great Saltash Bridge* is on the same principle, with four spans, the two principal not less than 445 feet.

The objection to combination girders does not apply to those made all of wrought iron. In cast iron the girder is broken by the first deflection, but no mischief is done to wrought before the trussing bars or suspension rods are called into action.

The *Boyne Bridge*, on the Dublin and Belfast Railway is one of the finest examples of the *lattice girder* which has hitherto been executed. The main span is 264 feet between the bearings, the two side spans 137 feet. At the end next the town of Drogheda are thirteen arches of masonry of semicircular form, 61 feet span, at the other end are three similar ones. These are built of finely wrought stone. The height of the bridge above water mark is 100 feet, allowing the passage of shipping without striking top gallant masts. The depth of the lattice girder is $22\frac{1}{2}$ feet. It is formed of top and bottom wrought tubular chords, the area of the top chord where the greatest strength is required is 265 inches, where the least, 137, the lattices are placed on each side of the chord at an angle of 45°, 7 feet 6 apart, forming double squares in height, the sizes vary from 10″ by $\frac{5}{8}$ to 4″ by $\frac{5}{8}$ acccording to the strains; they are closely bolted to cross braces at the intersections. There is a double line of railway, with the girders on the outside, measuring 24 feet 6 in the clear; the roadway is supported on cross beams also on the lattice principle 7 feet 6 apart, covered with 6 inch planking bolted down. The girders being joined over the piers form one length, and are fixed only on one pier, the other supports being the usual rollers working in grooves to admit of expansion. Sir J. M'Neil was Chief Engineer; Mr. Burdon and Mr. Barton (to the latter of whom I am indebted for much information on the subject) were the Resident Engineers.

It will be perceived that the principle of the lattice girder does not materially differ from that of the large tube, the sides of the former being open with lattices where material is not so much required. With the same weight of metal the lattice girders will carry a greater load than tubes. The comparative duration has not yet been ascertained, but the lightness and elegance of appearance and several other considerations are greatly in favour of the lattice bridge. For further particulars useful reference may be made to notes of the comparative strength of the tube, Warrens', and the lattice girder, by Mr. James Barton, C.E. Various opinions have been also given by eminent Engineers which will be found in the Transactions of the Institute of Civil Engineers.

In forming a comparison of the materials to be used for any particular work, whether a bridge or a viaduct, many questions have to be taken into consideration, but none more important than that of economy. To arrive at that, the original outlay and the probable durability must be taken into consideration; and from what has hitherto taken place the conclusion arrived at appears to be in favour of wrought iron; but it should also be noticed that metals can be destroyed by repeated vibrations, which have a tendency to separate the particles of which they are composed. As a sufficient excess of strength, should be provided, this objection does not detract from the value of the material, while it demands additional skill and ingenuity on the part of the constructor.

Stone and Brick Viaducts.

	Height. feet.	Span. feet.	Length. yards.
Sunderland	130	160	200
Langollen	145	90	550
Rhymney	140	40	400
Congleton	114	50	350
Ouse Valley	110	45	480
Folkestone	100	30	200
Stockport	100	60	600

Timber Viaducts.

	Height.	Span.	Length.
Dinting	120	125	200
Landore	109	90	600
Scotswood	—	60	350

American Timber Viaducts.

Portsmouth River	—	250	—
Columbia	—	200	2200
Cumberland	—	175	1400
Portage	230	50	250

Iron Viaducts and Bridges.

	Height.	Span.	Length.
Crumlin	200	150	550
Sitter	200	137	200
Britannia	120	460	500

Iron Viaducts and Bridges—continued.

	Height. feet.	Span. feet.	Length. yards.
High Level	120	125	250
Chepstow	120	290	250
Boyne	120	260	350
Saltash	120	445	450

Stone and Brick Bridges.

	Span.	Rise.	Date.
Chester	200	42	1833
London	152	30	1831
Gloster	150	35	1827
Ponty Prydd	140	35	1755
Maidenhead	128	24	1835
Neuilly	127	35	1774
Waterloo	120	38	1816

Suspension Bridges.

	Span.
Niagara, Queenstown	1040
Wheeling	1010
Freyburg	820
Niagara, at the Falls	760
Pesth	678
Hungerford, London	676
Menai	580

Mr. G. R. Burnell, Visitor, observed that Mr. Clayton had hardly given a sufficient account of the practice of modern days, especially with respect to the works constructed of brick and stone. He had omitted altogether a most extraordinary series of works lately executed on the railways of Saxony. Amongst this class of works was also the aqueduct of Roque Faveur, near Marseilles, the length of which was upwards of 1300 feet, and the greatest height 280 feet from the valley beneath. On the Saxon railways the height of the principal pier of one viaduct was 302 feet, the total length of the viaduct being above 1900 feet. It was almost entirely of brick, the span of the larger arches being about 96 feet. Mr. Clayton stated that the original application of cast iron on the voussoir principle, hardly extended beyond a span of 100 feet; whereas a Report to Parliament in 1808, contained a design, by Telford, for London Bridge upon that principle, in one span of above 600 feet. With regard to timber bridges, he (Mr. Burnell) had designed some of bent timber ribs, with a span of 140 feet, and had followed out the execution of them, but in five or six years they had failed, from the continual vibration opening the joints, and allowing the moisture to penetrate. With respect to timber viaducts, there were several in the United States of larger dimensions than those mentioned by Mr. Clayton. He had seen some of 240 feet span, and near Philadelphia there were some even larger. Timber Lattice Bridges were objectionable because the timber was sure to warp. The Parliamentary Commissioners were therefore right in opposing the lattice principle in timber, but not in objecting to it in wrought iron. Its application in wrought iron bridges of large span would form an interesting subject for discussion. The ultimate durability of wrought iron bridges was still a doubtful point, and indeed, foreign engineers appeared to be giving up the application of that material, and to have employed cast iron on the voussoir principle on the railways recently finished in France for bridges of 160 and 170 feet span. As to compound girder bridges, he thought their failure did not so much arise from the unequal contraction and expansion of cast and wrought iron, as from the suspension bar having no support independent of the girder itself; so that if the latter failed anywhere the wrought iron truss must fail with it. Thus a good principle might have been laid aside because attention had not been called to a defect in its first application. The aqueduct at Spoleto, in Italy, deserved more notice. It was said to be of the time of Theodoric, but he did not think it could be so ancient. For height and boldness it would bear comparison with any modern viaduct. In the Crumlin Viaduct, he considered it philosophically wrong to make the girder of the same depth throughout. The form of the girder of the Ouse Bridge was far more logical.

Mr. CLAYTON stated that he had given the average dimensions of the metal; the girders were slightly curved, and all the proportions had been carefully calculated to answer their intended purpose.

Mr. C. BARRY, Fellow, said, that instead of blaming Mr. Clayton for not referring to more numerous instances, he felt that he had almost overwhelmed them with matter for discussion. No doubt if the subject were to be entirely opened, many structures of a like kind would occur to gentlemen present, and to Mr. Clayton himself. With regard to the Crumlin Viaduct he had understood Mr. Clayton that the lofty piers or bearings were made of a series of stages of columns braced together, but all of one thickness of metal from bottom to top.

Mr. CLAYTON explained that the core was a little altered, so that there was a larger section of metal below than above.

Mr. M. D. WYATT, Hon. Sec., stated that he saw the beam directly after the test weight was taken off, and it had not sustained the slightest injury. There had never been a work of the same kind executed, in which the preparation of the necessary variety of patterns, or the immense number of different pieces, was so great as in this instance.

Mr. CLAYTON, in answer to a question, explained that the columns were inclined from bottom to top throughout. The bearing of the base was inclined, but all the other joints were at right angles with the axis of the columns.

Mr. DONALDSON, H.S.F.C., said it had always been the principle of the Institute to accept with gratitude any information afforded in the papers read, whether complete or incomplete, and not in any way to question its extent, or to suggest that the author should have extended his researches in order to render it more comprehensive. For himself he had derived much information from Mr. Clayton's paper. It was exceedingly interesting to note the ingenuity of modern engineers in endeavouring to accomplish the objects of strength, capacity, and economy.* He had not risen, however, to enter into any of the interesting questions raised by the paper, but to vindicate the Institute, by expressing its thanks for the information thus brought forward. Of course they would be equally thankful for additional or supplementary information from any other gentleman. He begged to move the best thanks of the Institute to Mr. Clayton.

Mr. G. R. BURNELL disclaimed any intention of finding fault with the paper. He wished simply to call attention to some important works which had not been noticed.

The CHAIRMAN (Mr. BUNNING, V.P.), in putting the motion, which was carried unanimously, observed that it was impossible in one paper to notice all the great bridges and viaducts of the last few years. He hoped Mr. Burnell would favour the Institute with a paper illustrating the examples he had referred to.

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* The famous bridge over the Danube, built by Trajan, consisted of 20 piers of squared marble, 150 feet high, 60 feet wide, 170 feet apart, surmounted by framed wood work, which formed the roadway. Illustrations of this bridge exist on the Trajan column at Rome, and are engraved by Bartoli.

ADDENDA.

Messrs. Kennard are now constructing some girders for bridges on an Indian railway, on the half lattice or Warren principle, with a reverse bearing to those of the Crumlin Viaduct. The upper beam is cased, and the bottom tie is formed of bars much in the same way, but the support being altogether under the whole girder, the ties and struts are changed, and the last strut runs on to the bearing on the piers. The girders are 90 feet long and 7 feet deep, and are placed 14 feet apart. The roadway is sustained just above the bottom tie by suspending plates from the upper beam, which are also connected below and made to act as vertical ties to the whole. There are thirteen diagonals in each direction, and the pins connecting them differ in size according to the strain; the largest being connected with the bottom tie. They vary in diameter from 4″ to 2½″ from the ends towards the centre, and those to the upper beam from 3 to 2 inches in the same direction. The number of bars in the bottom tie increases from two to eight, which are very nearly of the same thickness.

ERRATA (in paper of April 28, 1856) line 19, page 132. " Mr. Papworth observed that the principle of the beam had been approved (NOT APPLIED) by the late Mr. Thomas Cubitt for a roof of 100 feet span."

ON THE DOMESTIC BUILDINGS OF WESTERN FLANDERS IN THE SIXTEENTH CENTURY, ILLUSTRATING THE ORNAMENTAL BRICKWORK OF THAT PERIOD.

By R. D. Chantrell, Fellow.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, June 2nd, 1856.

Belgium, for the last twenty-five years only an independent kingdom, had previously undergone as many changes as it contains provinces under Austria, Spain, Holland, and France, and was at the commencement of the present century subdivided under the last named power into departments named from the rivers or other local features. It is now, however, restored to its former Flemish counties, Brabant in the centre, containing the seat of royalty, Brussels, with Antwerp, celebrated for its fine cathedral, East Flanders with its capital, Ghent, the birth-place of our John of Gaunt, and West Flanders with its chief town Bruges.

On the east and south the provinces of Limburg, Liege, Namur, Luxemburg, and Hainault, all more or less mountainous districts, offer in their products of coal, iron, stone, marble, clay, and timber, nearly all the materials required for building.

West Flanders was once the most important province from its long line of sea board, with the ports of Dunkirk, Furnes, Nieuport, Ostend, Sluys, and Damme. The last, now a mere farming village with a population under nine hundred, was once a strongly fortified town containing more than 25,000 inhabitants, who early in the thirteenth century destroyed a fleet of 1,200 ships sent against them by Philippe Auguste, King of France, in the Bay of the Zwyn, which has now been long warped up, the sea having receded nearly six miles. The French shortly after burnt the town, but in 1384, it was so strongly fortified that it resisted for a considerable time an army of 80,000 men, and was forced to capitulate only from the want of fresh water. Its grassy ramparts still indicate the site of massive brick bastions and extensive lines of fortification, while its name denotes that like Ostend, Furnes, and Nieuport, the besieged could innundate the surrounding country so long as they held the dam or flood-gates, and that there was a dam to retain the supply of fresh water which was conveyed to them by the Bruges canal.

The whole surface of the country towards the north is covered with loose, light sand, and clays and marls are only found in the east and south at some depth below it; so that brick, lime, and stone are obtained from a distance by means of the canals with which the country is intersected, although railways now traverse a large district and must soon tend to expedite the traffic. All the western province is low and level, like Holland, and only needs locks to pen up the water to float their inland vessels or canal boats, whilst portions of the dykes may be under repair.

Above the trees lining the canals and roads are seen some few of the plain brick towers of the village churches with their high pitched moss-grown tiled roofs, their apses and their crosses. On the canal from Bruges to Sluys the first is the fine old thirteenth-century brick tower of the Church of Damme, which is over 150 feet in height. The nave, side aisles, and transepts were destroyed at the close of the last century by the French Revolutionists, by whom the churches were either converted into "Temples of Reason," or used as Cavalry Stables; the bells were coined into money stamped with the cap of liberty, and the fine painted glass was removed from the windows and sold in some instances to London glaziers, who retailed it at their own prices.

The nave of this church did not exceed 80 feet in length, but the choir, now reinstated as the village church, is more than 100 feet in extent from the eastern face of the transept to the spring of the apse of the high altar, and 36 feet wide in the clear; the aisles of 28 feet each, and the clustered pillars of 5 feet each, give more than 100 feet total width. These dimensions as well as the height are nearly the same as what remains of the nave of the fine old Priory Church, now used by the Dutch Protestants, in Austin Friars, London.

The windows have moulded bricks externally, but within, the capitals, bases, column shafts, piers, pillars, string courses and mouldings, are of a hard blue lime stone from Ecaussines, in Hainault, near to Nivelles in Brabant.

In most parts of Belgium this hard blue stone (somewhat akin to our blue or black mountain limestone from Skipton, in Craven, West Yorkshire), by the French named "Pierre d'Ecaussines," and by the Belgians "Orduyn Steen," is used for decorative purposes only, the cost of working almost preventing its common use. A stone, somewhat similar in appearance but softer, is obtained from the Weald formation near Tournai, in Hainault; it is known as Tournai stone, and is sometimes used for building, but generally for paving. It bears some resemblance to our Kentish Rag but it is rather darker in colour.

The Town Hall or "Stadt Huys," at Damme, is partly faced with it, the pinnacles, steps, brackets, and other ornaments are of the Ecaussines stone, but the end and back wall sare of brick; the vaulting of the basement, once the guard-house, now a stable, has the pillars, arch and groin ribs of stone filled in with brick. This building is now used as an "Estaminet," or tavern. Internally, some of the rooms have plastered walls, but others are bare; all the large floor beams are of oak, richly carved, and the joists and boards are of the same wood; in one of the rooms is a plastered ceiling of the last century; the walls are generally lined with oak panneling to a considerable height, and some of the "Arras," or tapestry remains above it.

Advancing eastward on the canal we see the church towers of Oostkerke, Houcke, Lissweghe, West Capelle, and others, which point out the locality of the several villages; the Church of Damme being the type of the whole of the churches, but of more importance.

On the east side of the road to Blankenberg all the churches have towers, while on the west, even to the frontier of France, they have all variously formed spires.

On the right of the Town Hall, at Damme, is the ornamented brick house belonging to the Burgomaster, the farm buildings are on each side; over the entrance door is an ornament carved in white stone (like that of Paris) from beneath the clay of Dieghem and Martélanche. At Iseghem on the line of railway between Bruges and Courtrai the church is in course of re-construction entirely with this stone. The rest of this house is built wholly with brick, and the roof is covered with pantiles; the front has piers corbelled out on the lower story which terminate with arches above, and form recesses moulded with a bead and hollow, the former describing the jamb and arch and the latter the tracery; the tracery forms a second hollow, and the wall within the recesses recovers its face by the projection of the window cills. In the further portion or mass of this house, which contains the entrance door, the piers rise from the base, and the recesses are plain, though the mouldings are the same as in the traceried portion.

The bricks are similar in dimensions to those of this country, but there is a small compact red brick called by the natives "Brabant Steen," resembling the old Roman brick in quality, and which, set in Dutch tarras, makes very sound work. In some of the oldest buildings a large brick has been used, of ordinary proportions, but one-third larger; it may be seen in the churches, town halls, and gates. It is made of unmixed clay and remains very perfect.

On entering the town of Bruges we are reminded of the olden times by its gates, which are closed at nine o'clock every night. The old Ghent gate will convey an idea of those remaining, viz., the Porte Marechale, St^{e}. Croix, and d'Ostende; those of Bouvine, St^{e}. Catherine and St. Laurent or Damme, having been rebuilt or modernized. The fortifications have long been dismantled, but the broad moat still surrounds the ramparts and a second moat outside, but not so broad as the first, shows that the town was well calculated for a long and formidable resistance to besiegers. The buildings have an uniform yellow tint, which arises from a regulation of the Municipality long in force, and gives a very cleanly aspect to the place, the yellow washing being required annually. In the earlier years of this century contrast was the fashion, and every one compelled to colour the front of his house chose the most opposite coleur to his neighbour, as red, pink, blue, green, &c. The yellow colour predominant in the several illustrations will thus be accounted for; whether this originated in the large villages of Gheluwe (yellow) and Ghelu veld (yellow field) I cannot say, but a few years ago on my way from Courtrai to Ypres, I first noticed in both these places that all the buildings were yellow washed even to the churches.

I have selected a few of the most striking brick house façades in Bruges, where the high roofs terminate in picturesque gables, ornamented with arches and tracery. There are as many of them with plain copings as with steps, though these stepped roofs have always been considered essentially Belgian. The old chimney stacks were ornamented and invariably covered over to check the eddy or down draft occasioned by the lofty roofs, and though few remain intact, it is found necessary to cover the flues, so that a most curious amalgamation of ridge tiles is seen crowning the chimney stacks in every part of the town. Wood is invariably burnt by the inhabitants upon the hearth, rested upon a piece of iron called a dog, as coal is of comparatively recent introduction by the English residents; the flues are smaller than ours, and are usually cleansed about once a year by an iron ball attached to a rope and a bundle of straw at the other end. Sometimes two dogs or "fire irons" were placed on the fire brick hearth for the small bundles of wood or faggots, and were highly ornamented with figures and devices very creditable to the skill of the smiths. The large open fire-places have usually a large slab of Ecaussines stone, moulded, on each side, and a deep mantel which projects considerably, and the chimney breast above it is highly ornamented. Many of those from the town halls of Bruges, Courtrai, Oudenaerde, and other places, are most elaborately carved, and have been made known to us by the accurate drawings of Mr. Louis Haghe. The inside under the lofty mantel is frequently lined with white Dutch tiles, which give a light and cheerful effect. In ordinary houses, the white and blue figured tiles with grotesque ships, windmills, and landscapes, give a far more pleasing aspect than the blackened cast iron contrivances, which convey the heat up the chimney and radiate but little into the apartment of an English house. Now occasionally the fire-places are closed and stoves placed in front. Our kitchen fire-place is rarely seen in Belgium, the cooking being performed on open "Carréfours" or square furnaces, with charcoal, or rather the wood ashes from the bakers' ovens.

In many of the streets groups of buildings remain unchanged, and the Rue Queue de Vache affords one of the best specimens of street architecture, having decorated houses on each side. The date, 1561, upon one corner building, is formed by iron bolts or bars bolted through to the beams, which rest upon the solid front piers, and act as main ties to the floors, roofs, and walls,—these irons, which are called by the Flemmings "Ankers" (Anchors), may be observed in all the old houses. The large oak beams and joists, having always been exposed, are as sound as when first placed. The beams usually extend from the front to the back wall, crossing the brick partitions; the joists are either laid upon or dovetailed into the beams, flush with the upper side, and the floor boards are pinned or trenailed to them. In the better houses parqueterie is laid over rough boards, but all are kept polished, as carpets are luxuries till recently scarcely known to the Belgians.

The streets are paved with large pebbles or shingle from the sea shore; they incline from the houses to the middle, where a channel or gutter is formed, and a side footpath is scarcely seen, except of recent date; the water from these middle street channels is conveyed by shoots into the numerous canals, so that after a shower of rain the streets are soon clean and dry.

Sometimes before an entrance door a narrow paving with slabs of Tournai stone (each about a foot square) is found, which like our Rock Hill flag is slippery when worn and wetted. The floors of the entrance halls are also paved with small Tournai slabs; the wooden and brick floors are usually sanded.

In the adjoining street, "Rue des Aiguilles," is another picturesque brick building, formerly the town residence of the Counts de Saint Pol Tiennes, now the school for instructing poor girls in lace making, founded in 1816 by the Abbé Defoere.

In this building there is another feature said to have originated in Bruges—the staircase turret carried frequently to a considerable height for the purpose of an observatory. Mons. Delepierre, Belgian Consul in London, a learned antiquary, states that the foreign consuls and merchants had them erected that they might witness the arrival and departure of their ships. The lower part is of brick, and the foliated gallery and crocketted spire of white Dieghem stone. There are varieties of them in the town, for though numerous, no two are alike. The salient angle turret is another peculiar feature of Belgian buildings, both in town and country; some of very remote antiquity are circular on plan, the angular forms being later, both hexagonal, octagonal, and multangular. Sometimes they are corbelled over with plain or moulded bricks, and occasionally they spring from large, richly carved stone brackets.

Nearly opposite to this, in the "Rue des Tonneliers," is another lofty house with arched and traceried recesses, terminated with a square screen or "*masque*," raised only in the centre to take the bolt of the ridge piece of the roof. This, with the lower portion adjoining and the further gabled building, formed one large house, with a court yard in the centre. The basement and gateway jambs and arch are of Ecaussines stone, the rest of old red brick. The rooms of this and most of the large houses of this time are at least 15 feet in height; they were erected when Bruges was the emporium of commerce, and its prince merchants were of the class of Shakespeare's Antonio.

They had their East India Company's House, with its lofty tower, now only hinted at by the adjacent "Tower Bridge," but shown on the old illustrated map by Marcus Gerardus, 1562, in the Town Hall; the Dukes of Burgundy and of Brabant, and the Counts of Flanders had their palaces of the "Seven Towers" on the Bourg adjoining the Town Hall, the Cathedral of St. Donat (the last remains were removed in 1805), and the Church of St. Basile; the Palace "Princen hof," or Court of Princes, and the Mint were near together. The house in the Rue des Tonneliers was once occupied by King Charles the Second of England when in exile. He then patronized the Society of Archers of Saint Sebastian, and on his restoration gave them his portrait and some valuable presents, which still decorate their ancient hall.

The population of Bruges was then over 200,000, but now it is not one fourth of that number; and from its frequent sieges, and the destruction of its cathedral and many churches and religious houses towards the close of the last century, gardens of great extent are attached to many houses in the town. Two other square fronted houses of later date are equally decorated, though differing in character. The basement is of stone up to the windows, the upper part of red brick moulded in the arches and jambs, and the ornaments are panelled, fretted, or reticulated, all of varied patterns. The parapet is embattled, and over each pier is a corbelled turret decorated like some of our Elizabethan chimney shafts: the upper parts have been destroyed. Over the arches are inserted white stone medallions.

This building, and another in the Rue Neuve opposite, are called the Spanish Houses; both are covered with terraces or lead flats, and have their beam "ankers" in the piers.

On this square stands the great belfry, or as it is now called "Tour de la Halle," built of brick in 1291. The quoins and some of the mouldings, the hexagonal pinnacles of the upper stage, the angles of the upper octagonal stage, the small windows, belfry jambs, and the arches are of stone; the masks or salient angles, and the body with the recesses and some of the tracery, are of brick.

Of the form of the original termination there is no account, but after being struck by lightning in 1492, it was decorated with a wooden bulbous formed composition, which was again destroyed by a storm in 1741. It was then covered with a common low pitched roof till 1824, when pinnacles and a parapet were added.

This tower was at first insulated, but in 1364 the large hall surrounding it was built by the cloth merchants for their market house, in which the annual fairs are now held. The tower is about 300 feet in height, and with that of the Church of Notre Dame, 360 feet high, may be seen from the sea on approaching the Port of Ostend. The belfry contains four octaves of bells, varying from 23,000 to 28lbs. in weight. The apertures are open, and the bells visible; they are firmly attached by the head to oak frames, and are struck on the external surface by hammers connected with levers balanced by weights, and raised by strong wires also acted upon by metal pegs inserted in a large copper cylinder, turned by a weight which is wound up daily. Four airs are set upon the cylinder, one for each quarter of an hour; these are generally changed once in three years. On Wednesdays, Saturdays, and Sundays, from noon till one o'clock, modern airs are played on the bells by a professor of music, who strikes keys properly balanced. These chimes or carillons, which are said to be the finest in the world, were invented in 1469 by a native of Alost, near Gand, and first introduced in this tower in 1503 by Simon Waeghenlis, of Mechlin. The bells were recast in 1675 by Melchior de Haese, of Antwerp, and again after the fire in 1741 by Georges and Jaques Dumery. They remain in very perfect condition, though exposed for more than a century to the action of the weather. In 1805, when preparations were being made for a descent on England, being a detenu in the town, I could see with a telescope our English blockading squadron from this belfry.

Crossing the Grande Place to the Rue Flammande, I have selected from the numerous brick buildings a curious front, rising from a central pillar and corbels which project two feet from the end walls; all is brick excepting the pillar shaft, brackets, key-stones of the arches below, and the huge crockets and ornaments on the coping of the gable, which are of Ecaussines stone. Continuing by the Quai des Augustins, and passing several of the same class of houses, at the corner of the Rue Espagnole, is a double-gabled house bearing the date 1596 in front, and on the Quai de la Main d'or adjoining (on the site of the India House and doubtless a portion of it), is a building with the corners bevelled off for brackets and canopies to contain statues of saints, many of which have been re-instated; the recesses are richly moulded and contain pillar bases, but the roof has been recently modernized, the gables, arches and tracery removed, and a wooden cornice substituted. This will give an idea of the general style of modernization now in progress. Opposite this building are two very singular gables; the recesses are moulded and contain pillars with capitals and bases. Leaving these buildings by the Place des Orientaux (now Wednesday Market), we arrive at the Place de l'Academie. The Academy of Arts is a doubtful restoration of the fourteenth century hall burnt 1755, but near to it is the sixteenth century Weigh-house, for regulating the towns dues, or "Octroi." The steps, columns, arches and tracery, with the curious recessed window, are of stone, but the warehouse portion of the building is of brick; within sight of this building are nearly a dozen others of the same class, and the old Exchange is a fine specimen of a hall of the fourteenth century. On the "Quai-long," bordering the canal, which passes through the town and unites those of Gand and Ostend, is another good example of this class of houses. In St. John's Street among several others, one is selected for the curious line of junction of the arches; and in the Rue des Pierres we find a very lofty gable covering five apertures in width. At the back of the "Palais de Justice," communicating with the old Corporation Hall, or "Maison des Francs," which contains the celebrated carved chimney-piece in stone, marble, and oak, is a curiously ornamented brick gable, so situated that it can only be seen from a private garden, from which an arch leads to a vaulted basement under the hall, the front of which, with curious angle turrets springing from corbels, faces the canal of the Fish Market. The high pitched roofs are covered both with pan and plain tiles. Most of the roofs are lighted by glass tiles of the same form and thickness as those of clay; they have been used for ages as well as the conical ventilators which are made to fit to both plain and pantiles. The general character of the buildings is not confined to the vicinity of Bruges, for there were many of the towns proportionately opulent which are now equally reduced. All these houses were most substantially built; both the external and partition walls were of great thickness; the cellars invariably vaulted, the arches in many instances formed of accurately radiated stone and hard burnt bricks, usually set in tarras; in many of these houses plaster was entirely omitted, the walls being lined from the floor with panelled oak wainscoating or dado upon battens over trellis, upon which strong canvas was nailed, which was covered with stamped, gilded, and coloured leather, often tapestry, and even oil paintings. The floor beams were frequently carved on the underside. In the tapestried rooms, jib doors, with concealed hinges and spring latches, were well contrived so as not to interfere with the design. The windows (from their cross bars called croisées) are of considerable antiquity, and in many cases coeval with the buildings; they open on hinges both outwards and inwards, and sometimes slide and fasten by side bolts or iron pins. Sash windows are unknown.

In the fine old fortified frontier town of Ypres (now in course of dismantling) which contains but a tithe of its former population, the same general style of domestic architecture prevails. I was struck with the fine proportions of a lofty house built entirely with Ecuassines stone, and on enquiry ascertained that it was called "La Maison des Templiers," being a portion of the buildings belonging to the Knights Templars, erected in 1250. The remains of the corbelled turret are hexagonal on plan, and the tracery of the upper windows varies. This town contains a magnificent town hall of the 14th century, 430 feet long in front, with a large corbelled pinnacle at each end, and a grand central tower with corbelled pinnacles at each angle and a spire. The brick Church of St. Peter has corbelled, polygonal turrets at the angles of the transition Norman tower, and curious square projections on each side for staircases which rise from the ground. The body of the church, rebuilt with brick in the fourteenth century, is 250 feet long and 90 feet wide.

The Cathedral of St. Martin is a fine thirteenth century structure, with transepts and a grand western tower; a spire begun at the end of the fourteenth century is still incomplete, and some of the angle crockets remain within an enclosure on the north side as they were left by the workmen. Another fine (fifteenth century) church is St. Jacques', and there are several monastic buildings of later date. The towns of Commines, Wervick, Menin, Courtrai, Roulers, and Thourout, with many others, contain large brick churches, and their brick buildings present the same general features as those of the capital, Bruges.

Now, inferior brickwork and stucco are coming into fashion and superseding the fine old realities; on the Quai Saint Walburge, in Bruges, I recently observed that a large old building, used for many years as a cavalry barrack, was being prepared for the Athenée or public school of the town. The basement appeared to be of granite, but on approaching to ascertain whether it was granite or Ecaussines stone, I was surprised to find it only one inch thick, a mere plaster imitation; this too a public work conducted by l'Architecte de la Ville!

All modern buildings are of the same character; plaster fronts, wood or plaster cornices, are rapidly superseding the old gabled realities, and compo is there as here the genius of the age; plaster and paint imitating whatever modern taste, or the want of it, requires.

All these old buildings in their picturesque variety, with sufficient light and shade, required not the aid of colour to improve them, and the Spanish as well as the Gothic traceried elevations might suggest an idea for improving the style of decoration in our street architecture without having recourse to mere copyism. Brick, no longer subjected to an excise duty, might be moulded to any form required by the architect, arches, semicircular or segmental, thrown over apertures unlimited in extent, and window openings made of adequate size for the admission of light and air, with every comfort that the most sanitary measures could demand; ornament might also be introduced in a similar manner, and skylines formed of great variety with brick (when the expense of stone precluded its use), properly set in cement, which ought to be capable of resisting the effects of rain, so that we might have dry and durable houses. The great difficulty arises not from want of skill or good materials, but from the admixture of inferior and improper ones by the speculating builder, who, though he professes to build cheaper than the architect, will ultimately prove more expensive to the unfortunate owner, who is deceived by the flimsy cloak that for a time covers the rottenness beneath it.

The Chairman (Mr. G. G. Scott, V.P.) in requesting from the Members remarks or inquiries in further elucidation of the subject, called attention to the elaborate manner in which the MS. of Mr. Chantrell's Essay was illustrated with a series of excellent sketches, which Mr. Chantrell had kindly presented to the Institute. The Chairman proceeded to observe with regret that the great towns of Belgium had sunk from their former commercial importance into comparative decay, and that "compo" was every day detracting from their architectural interest. It would be most desirable to have the ancient buildings of Belgium fully illustrated by measured drawings; for street architecture these buildings furnished a most valuable field of study. The brick buildings of Italy and North Germany were better known than those of Belgium, probably because the latter were in remote towns at a distance from the main lines of railway. Thus, from Calais to Ypres, all the little towns were full of beautiful specimens of brickwork, both in the churches and houses. He might say that there were four great brick districts in Europe—1. some parts of England, particularly Norfolk; 2. Belgium; 3. the North of Germany; and 4. the North of Italy; each of them deserving of attentive study. There were also three sizes of ordinary bricks. The size now used for ordinary commercial purposes, being that which could be most easily handled and laid, would always prevail, but there were two other sizes. In the north of Germany they had not only a brick of our own ordinary size, and one about 7 or 8 inches long by 1½ inch thick, but also an enormous brick used for buildings on a magnificent scale, being more than a foot long, 3½ inches thick, and 6 inches wide. These were used with great effect in churches, city gates, &c. With regard to brick bond, the Chairman observed that at Richborough Castle bricks were used at certain intervals to bond together with flint rubble, over the face of which they were in some cases made to turn down. As the restrictive duty on bricks had beed removed, it seemed absurd that architects should have gone on for four or five years without any application (except in a very few instances) of moulded bricks to ornamental uses. The misfortune was that they never prepared their working drawings long enough beforehand to give time for making moulded bricks. A great deal might easily be done not only with moulded but with cut bricks, of which some beautiful specimens might be found in the 16th century buildings about London. Bricks fit for this purpose could be obtained not far from the metropolis, at Hedgerley and Chalfont. The moulded bricks on the Continent were often glazed with a green or black glaze, which gave them a very rich effect. At Lille there were some bricks with a bright green and a bright yellow glaze.

Mr. CHANTRELL said that glazed bricks were also used at Tournay and other places in Belgium, near the frontiers of France. They were still made at Rupelmonde, a great place for the manufacture of bricks, near Malines.

Mr. M. D. WYATT, Hon. Sec., in reference to the manufacture of glazed bricks, said that the difficulty appeared to be to find a glaze which would expand and contract in the same ratio as the brick itself.

The CHAIRMAN said that it was the custom in Belgium to make bricks extremely rough, and to shape them afterwards with an axe; and Mr. CHANTRELL stated that this practice had been handed down from a very early date.

Mr. JENNINGS, Fellow, with reference to the English cut bricks of the 16th and 17th centuries, observed that they were all kiln burnt. Modern bricks were very unequally burnt, and besides the inferiority of the material, it would be more expensive to cut them for ornamental work than to employ stone. He referred to some beautiful cut brick capitals, about 200 years old, where it was evident the bricks had been built up first and cut afterwards. There would be no difficulty in getting bricks of any form or size if the demand for them existed, but brickmakers justly complained that they would not be able to get rid of any new forms or sizes.

Mr. POCOCK, Fellow, concurred in the opinion that the adoption of moulded bricks depended entirely upon the time necessary for making them, and not on the extra expense. He knew a case occurring within the last few days, in which a gentleman had been obliged to abandon the use of a particular form of brick which he particularly desired, because he was told that it would take six weeks or two months to make them. Unless architects allowed the necessary time, there was not much chance of moulded bricks coming into use again. Mr. Pocock added that the rosettes in the metopes and the mouldings of the well known house in St. Martin's Lane, had been cut after the bricks were laid.

Mr. DONALDSON, Hon. Sec. for Foreign Correspondence, remarked upon the singular fact that in the Belgian works the tracery was generally placed in the solid panels, and not, as in England, in the heads of the door and window openings. It would be very interesting to know exactly the manner in which this brickwork was put together, and particularly whether two or three originally types only were employed, and applied in different ways, as in the Moorish style, or whether the bricks were put up in rectangular forms and cut afterwards. He hoped Mr. Chantrell would investigate this point during his next annual visit to Belgium. Before moulded bricks could be successfully employed in England, it would be necessary to train a class of workmen for the use of them. With regard to the Belgian buildings it was a matter of regret that the high pitched roofs and other picturesque features had in many cases disappeared, and also that the fine brick work was disfigured and concealed by white and yellow wash. The smith's work of Belgium, briefly referred to by Mr. Chantrell, was of great excellence, and had been ably illustrated in the works of Mr. Haghe and Mr. Digby Wyatt. Mr. Chantrell had referred to the Spanish Houses of Bruges, and it was a curious circumstance that although the Spanish dominion in Flanders existed only 150 years, the buildings of that era, both in Bruges, Lille, and other towns, displayed a distinctive and magnificent Renaissance character, with large bold features and richness of decoration. He did not think the white stone employed at Bruges resembled that of Paris, but that it was rather an indurated chalk such as was found at St. Omer. While on the fronts of some of the Belgian houses the iron work bore the date, on these Spanish houses the year was sculptured in the stone panels, so that a chronological series of them might be selected.

Mr. **Papworth**, Fellow, said that the English moulded and cut bricks were of a very different material from those now in use. Some good specimens would be found in the doorways of the two Temples in London. They were kiln burnt, with a close grain, made without breeze, and were laid, not in mortar, but in lime cream, thinned to the greatest possible extent, and they were sometimes driven into their place with a mallet. The work was left out in bosses where necessary, and these were cut to the required form. After being worked with the chisel they had to be rubbed, so that an enormous amount of work was necessary, and a 13 inch capital would not cost less than £6. or £8. at the present time. He believed the comparison of cost between moulded bricks of common form and common Portland stone would be a little, but not very much, in favour of the latter. To the four brick districts already mentioned, he begged to add another, the south of Spain, where some very interesting works existed. The Spaniards also used terra cotta, and of this material there were some examples in England. These dated from before the Civil War, and preceded the use of sculptured brickwork, which came in after that period.

Mr. **Scoles**, Fellow, said that moulded bricks had been extensively used (for the tracery of windows, &c.) at Cossey Hall, Norfolk, the seat of Lord Stafford. These bricks were made upon the spot, and he believed that the damage from breakage in burning rendered them as expensive as stone. For plain splayed work, however, moulded bricks would be as cheap as common bricks.

Mr. C. **Fowler**, Associate, said that the subject of brick buildings was peculiarly interesting to him, as he had had special opportunities of studying the subject, and had brought before the notice of the Institute the brick architecture of the north of Germany. The specimens illustrated by Mr. Chantrell were all of later date than those, with the exception of the Bell Tower of Bruges. The description which Mr. Chantrell had given of Bruges forcibly reminded him of the German towns, especially of Lübeck, where the wide but grass grown streets, and the houses, either untenanted or applied to other than their original purposes, exactly tallied with Mr. Chantrell's account of Bruges. In the practical application of moulded bricks the most essential requisite was to design so that very few moulds only should be needed. The buildings in the north of Germany presented great variety in their appearance, but the different forms employed were really very few. With M. Chateauneuf he had spent a considerable time in studying these buildings. They had drawn every moulding they could find, and the result was that the variety arose chiefly from the combination. They had also visited the places where the bricks were manufactured, and where in some instances the manufacture had been carried on for centuries. The brick-fields of Lübeck, for instance, had been in constant operation since the erection of the cathedral, repairs and other works being constantly required. At Lübeck the works were conducted in a very primitive manner, but at Rathenau,* where the best bricks were manufactured for Berlin, the more modern processes were used. All the German bricks were kiln burnt and retained their form better than the English clamp bricks. He believed that glazed bricks were not used at a very early period. Glazed headers however, accidentally vitrified in the kiln, were employed, and the use of artificially glazed bricks ensued. The latter appeared to have been glazed by dipping them into some solution, and perhaps burning them afterwards, but the glaze was certainly not applied before the brick was burnt. Mr. Fowler stated that his father had employed moulded bricks to some extent for the circular headed windows of a large lunatic asylum, without any extra cost beyond that of plain bricks, which, for such a purpose, would require to be axed and rubbed.

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* In the old Mark of Brandenburg.

Mr. Hayward, Associate, stated that the tower of the Church of St. Botolph, Colchester, adjoining the ancient Priory, was full of the most elaborate moulded brickwork, the work of the proprietor of a large brick-yard near the town; and it afforded a most satisfactory proof of our ability to execute any work of the kind.

The Chairman drew attention to the grandeur of the buildings illustrated by Mr. Chantrell, arising from their magnitude and height; points which were not sufficiently attended to in English street architecture.

A vote of thanks to Mr. Chantrell was passed unanimously, and the meeting adjourned.

ON THE RESEMBLANCE BETWEEN MEDIÆVAL AND CLASSICAL ART, AS EXEMPLIFIED IN THE GLASS PAINTINGS OF THE 12TH AND 13TH CENTURIES.

By Charles Winston, Esq., Hon. Mem.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, June 16th, 1856.

It may perhaps be recollected that on a former occasion,* whilst adverting to the harmonious agreement between ancient painted glass and ancient Gothic architecture, I alluded to the resemblance which the glass paintings, contemporaneous with the architecture of the latter part of the 12th century and early part of the 13th, bore to the antique; and thus I concluded, from their agreement with the architecture, that we might contrive to produce modern glass paintings equally in keeping with early Gothic architecture, and superior to the old ones as works of art, if, instead of merely copying these ancient remains, or perhaps barely correcting their bad drawing, we should strive to work up to those models of excellence which inspired the earliest Christian artists, and which have been admired, and, I will venture to say, will be admired so long as an appreciation of beauty shall continue to be a faculty of the human mind, although persons may occasionally be met with who seem to have been rendered insensible or indifferent to their merit by a too exclusive study of the Mediæval art. In the discussion which these remarks occasioned, the propriety of illustrating my views by means of a drawing was suggested, and I agreed to resume the subject whenever I was prepared with such a means of explanation. I have been prevented from fulfilling my promise earlier, but the delay is not to be regretted, since it has afforded me more time for consideration. Even now I would particularly guard myself against the supposition that the drawing produced pretends to be a perfect exponent of my views. To carry out those views as I desire would require far greater artistic power than I can command; and therefore I must request you to regard it not by any means as a finished design, but simply as an explanatory diagram.

The influence which classical antiquity exerted on the arts of the West, principally through Byzantium, has been repeatedly insisted upon, and illustrated by modern writers. In some instances we are almost able to see the very track by which such influence was transmitted; in others it is impossible to forbear ascribing much to the effect of local remains, the fruit of a Roman occupation; in either case it is difficult to discriminate between the work of native and foreign artists. Still, however, a common resemblance points to a common origin. A variety of causes may unite to render this resemblance more palpable on some occasions than on others. But the wider the experience, the more positive is the belief in the Byzantine or Greek character of Western art in the 12th and 13th centuries.

From this influence ancient glass paintings are not exempt. They are infected by it in the same degree as other specimens of pictorial art. I am sorry I cannot corroborate by documentary evidence the opinion I have formed from the appearance of the painted glass. When and where the art of painting upon glass was discovered is still a matter of conjecture. The testimony of the earliest writer, Theophilus, by itself only shews that, at the time he wrote, France was, *par excellence*, the country in which it was practised. He tells his readers, that they will find in his book "all the knowledge that Greece possesses in the kinds and mixtures of colours; Tuscany in inlaid works, and the various kinds of niello; Arabia in malleable, fusible, or chased work; Italy in the various kinds of vases, and the carving, enriched with gold and silver, of gems and ivory; *France in the precious variety of windows;* and industrious Germany in the delicate workmanship of gold, silver, copper, iron, wood, and stones." The Abbé Texier indeed—the author to whom I have had the most resort, because his inquiries are the most germain to my own pursuits—considers it probable that the honour of the discovery is due to the Limoges school of artists;* and though his chief reason, the similarity of the process of enamelling to that of glass painting, of itself is entitled to little weight, especially if the opinion be correct that Germany shared with Limoges the manufacture of enamelled ware, the leaning of my mind, in the absence of any evidence to the contrary, is in favour of his opinion. Our not finding any specimens of painted glass earlier than the 12th century or the end of the 11th, and these nowhere except in France—so far, at least, as I am aware of—affords a presumption that earlier specimens never existed, and that the commencement of the manufacture was in France. And I have long been of opinion that the glass used in the earliest glass paintings was made from Greek or Byzantine recipes, on account of its being so similar in texture and colour to the ancient Greek glass. Therefore (without, however, necessarily committing ourselves to the opinion that the art was discovered in France) I think we may safely conclude that it was discovered in Western Europe by some school of artists under Byzantine influence. Indeed, the very badness of the figure-drawing in the earliest examples, as compared with the excellence of the foliaged ornaments—and which, therefore, cannot be attributed, as in the case of the earliest Enamels, to any peculiar difficulty in the manufacture—is an argument in favour of the discovery being made by a school of artists as yet immature, such as a provincial school might be considered in comparison with that of Byzantium. And by way of accounting for the spread and intensity of Byzantine influence in France, I may mention, on the authority of M. Texier, that as early as 979 a Venetian colony was settled at Limoges, for the purpose of trading with the spices and other commodities of the East, conveyed from Egypt by way of Marseilles. Mr. Fergusson, in his very useful Handbook,† corroborates the supposition that it was with Alexandria that the Venetians had their closest connexion, though no doubt, as the great carriers of the Levant, they were, at that time, in frequent communication with Byzantium. To what extent the Venetians imbibed the Byzantine principles of architecture—in some degree modified by their commerce with Alexandria—is seen by a reference to their great Church of St. Mark (a building remarkable, according to Mr. Fergusson, for being the only real specimen of Byzantine architecture within the limits of the Western empire), and the Churches of St. Front Périgueux, the erection of which is ascribed to the Doge Orscolo I., who came to sojourn in France in 978. Souillac, Angoulême, Cahors, Solignac, Fontevrault Abbey, Fleac, St. Hilary of Poictiers, and others, all at no great distance from Limoges, attest, in their general architectural resemblance to St. Mark's, how thoroughly the colony carried with it the taste and arts of the parent State.

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* See Proceedings of the Institute of British Architects, Session 1853-54, p. 21.

The Byzantine school, thus implanted in France, was during a considerable period continually having its traditions revivified and corrected by the influx of fresh artists, and new works of art from the East. Greek artists, it seems, were living there in the 13th century; and as late as 1421 an inhabitant of Limoges brought with him an artist to carve a resemblance of the Holy Sepulchre, on his return, by way of Venice, from a pilgrimage to Jerusalem. If, then, glass painting were a French art, having its cradle in or in the neighbourhood of Limoges, we should expect to find its earliest remains displaying Byzantine features, and if so, the features more or less strongly developed of the

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* See Essai historique et descriptif sur les Argentiers et les Émailleurs de Limoges, par M. l'Abbé Texier, Curé d'Auriat. Published in the Memoires of the "Societé des Antiquaires de l'ouest." 1841, 1842. Poictiers. 8vo.

† "The Illustrated Handbook of Architecture," by James Fergusson, M. R. I. B. A. 2 vols. Murray. 1855.

Antique; and wheresoever the birth-place of the art may have been, I assert that its earlier remains do display those features. The most careless observer can hardly fail to be struck with the resemblance between the glass paintings of and towards the middle of the 12th century, and the illuminations in the contemporary Greek MSS., or with the frequent recurrence in them of Greek ornaments; and the same general character may be traced in glass paintings until quite the middle of the second half of the 13th century, when it gradually died out, before the increasing influence of a new style, of which the sculptures in the choir of Lincoln, to which Mr. Cockerell has directed our attention,* may be said to be an early and a favourable type. But the glass paintings which, on the whole, most closely resemble the antique are those which were executed between 1170 and 1240, or thereabouts. I am not seeking to deny that these works were executed by native artists either in France or England, but I cannot ascribe, as some have done, their greater freedom and closer likeness to good models, merely to the progressive improvement of a school. It seems more reasonable to suppose that the change was in great measure caused by the influx of Greek artists, and greater aptitude on the part of their pupils to profit by instruction. The draperies, instead of being tightly wrapped about the limbs, and scanty in their proportions, as in the earlier examples, are more elegant and flowing, reminding one of the voluminous draperies of the antique; which they resemble not only in the set, but the very form of the folds, betokening a material thin in texture, and, from its pliancy, allowing the action of the limbs to be easily seen beneath it. The heads, too, more nearly resemble the antique in their contour. In one of the windows of Canterbury Cathedral, erected shortly after the fire in 1174 (the second window from the west, on the north aisle of the choir), are some heads which might have been copied from the old Roman. There are some similar ones at Lincoln, in glass, of the same date as that of the north rose, and now worked into it, though not belonging to it. There is also a strong resemblance to the antique in the fashion of the garments. It is well known that the Romans had in great measure ceased to be the gens togata (Romanos rerum dominos, gentemque togatam) even in the reign of the Emperor Augustus. The Lacerna, a cloak fastened on one shoulder with a clasp, and sometimes furnished with a hood, originally borrowed from the army, became, on account of its greater convenience, worn with the Tunic, as the ordinary dress of the Roman citizen, and by degrees the Toga was reserved for State occasions. After the removal of the seat of empire to Constantinople, a variety of additional dresses were used, many of them of Greek origin. The more stately of which were, with its usual tact, appropriated by the Church, as it gathered power, and which are the foundation of the Mass vestments of the Roman clergy at this day. This has been clearly demonstrated by the learned Krazer,† whose accuracy, though it may have been painful to the High Churchmen, as shewing the Pagan origin of some of the most sacred things, has never been impugned. Some of these dresses were, moreover, adopted in their courts by the barbarian conquerors of the Roman empire, and thus were handed down to later times. The Dalmatic, in which the effigy of King John in Worcester Cathedral is clothed, is an instance, and the modern Peers' State robe is another. The most popular dress amongst those nations who possessed themselves of the territories of the Empire, no doubt, was the Tunic, with or without the Lacerna, or a shorter cloak used by the private Legionaries, called the Sagum; and this dress, with slight modifications, appears to have been in actual use in the 13th century. The Mediævals almost invariably adopted the Tunic with long sleeves in preference to that with short sleeves, which was the one usually worn by the Romans; and instead of the Braccæ and buskins of antiquity, they clothed the nether man in long hose, over which they used shoes or long boots. So that, with the exception of the legs and arms being clothed, there is but little difference between an ordinary 13th century figure copied from glass, and a figure taken from the arch of Titus, or Trajan's column. The long Tunic reaching to the feet, so common in the glass paintings of the 13th century, also had its prototype in Imperial Rome. The figures on the arch of Titus shew that it was at that time often worn beneath the Toga. Indeed, startling as it may appear, representations of the Toga itself are to be found in pictures on glass of the 13th century; and I have little doubt in my own mind that the mantle which, carelessly thrown over the long Tunic, constituted the conventional dress of prophets and of saints, not being ecclesiastics, throughout the middle ages—was, in fact, but a corruption of the Toga.

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* Proceedings of the Archæological Institute at Lincoln. 1848.

† Krazer de Liturgiis. Augsburg. 1786.

With regard to the Ornament, it is easy by means of the carved ivories, (of which I perceive a Catalogue by the Arundel Society has just been presented to this Institute) to trace the transition from the classical, to that used in the 12th and 13th centuries. It is so plain that the Mediæval artists borrowed their ideas of ornament from the antique, and which being so purely architectural and conventional is on that account I think the finest of all ornament, that I shall not urge the matter further. Indeed, the thing speaks for itself. I shall, therefore, proceed without further delay to deduce a few practical hints from the facts I have stated.

The question that naturally arises is—if glass paintings whose drawing so much resembles the antique, completely harmonize with the buildings of the 12th and 13th centuries; would not other glass paintings equally harmonize with such buildings, whose drawing should more exactly resemble the antique in point of excellence. I say in point of excellence, for I totally disclaim any intention of recommending the substitution of copies of Classical draperies or ornaments for Mediæval ones, or exchanging the individual character, and strictly human, as opposed to God-like, expression of the countenance which distinguish Christian art, for the more generalized and conventional treatment of the antique. I wish to see the Christian sentiment elevated but not obliterated by a study of the antique, and the Mediæval drapery drawn as the Mediæval artist would have drawn it had he possessed the power of the Greek.

I am persuaded that if the same tone of colour which we see in ancient glass paintings of the 12th and 13th centuries be adopted, all archæological requirements will be satisfied by adhering to the costume of the period, and general form of ornament, and preserving the individuality and character of the heads. Thus the attitudes of the figures, the arrangement of the groups, and general cast of the features, might be taken as closely as possible from the antique, whilst the draperies should be treated as being thin in texture, voluminous, accommodated to the limbs, and moulded into deep simple folds. I believe that works executed upon this principle would often be taken for old ones of very superior quality. No doubt to achieve such works would require far higher artistic power than is generally now employed in glass painting, and a vast deal more time to be bestowed on their preparation than is now required, all which would tend to increase their cost. But having confidence in the common sense of the country, I believe if the matter were properly presented to their minds, that most patrons of glass painting would prefer possessing one Picture window in a church, exhibiting a decent display of art, all the other windows being filled with good Pattern glass paintings, instead of being content as now with having every window filled with the veriest trash under the denomination of Pictures. The present want of artists to execute such works is no argument against the system, since we may be sure that plenty of artists would come forward as soon as they ascertained that their services were required. If the system is correct, there can be no insuperable difficulty in working it out.

Mr. M. Digby Wyatt, Hon. Sec., called attention to some drawings exhibited by Mr. Waring, Associate, which illustrated the principles laid down by Mr. Winston. He added that the best confirmation of Mr. Winston's opinions might be found in the works of the early Italian masters who studied entirely from the remains of Greek art, and whose pictures if transferred to glass would make the most perfect glass paintings that could be had.

Mr. Waring, Associate, said that in the drawings exhibited his object had been to shew that the best painting was applicable to glass as well as to any other material. In glass painting especially the end justified the means, and if the effect was striking and beautiful it was absurd to quarrel with the material. A general feeling existed that opaque objects should not be painted on glass, but in the drawings before the meeting representing windows in the Duomo of Florence, executed in the early part of the 15th century, colour was the means of producing the effect. The drawing was excellent, but colour was the great point the artists had in view. He had seen nothing in oil painting approaching the excellence of these works, and he believed when a painter witnessed the effect produced by the richness and brilliancy of them when the sun shone through them he would be tempted to throw away oils in despair. Tuscany was particularly rich in specimens of painted glass, and it was a matter of surprise that so many artists had visited Italy without describing or illustrating the numerous specimens there to be found. Mr. Waring gave the dates of the windows shewn in his drawings, and the names of the artists by whom they were executed.* He drew attention to the fact that in these works the design was made without regard to the intersections by the lead line, and he believed from examination of numerous specimens that the lead line far from destroying the effect of glass paintings rather added to it. In the specimen, from the Jerusalem Chamber, exhibited by Mr. Winston, the lead line went completely across the head of the Saviour, but if seen at a distance that lead line could never be observed. The idea conveyed by these works was that of a beautiful work in mosaic rather than a painting. The idea of the injurious effect of the lead line had induced a mode of treatment in modern works which produced the effect of transparencies rather than mosaic work. This was the case with some of the specimens exhibited in the Great Exhibition of 1851.

Mr. M. Digby Wyatt, said that in a former discussion of the subject there appeared to be some difficulty in understanding how it was that the black line was essential to beauty in stained glass. The reason was that those colours which transmitted most light were apt to spread upon the adjoining colours, and therefore unless the black line went round the light parts the whole windows would fuse, and the lighter parts would appear to eat up the shadows.

Mr. Donaldson, Hon. Sec. for Foreign Correspondence, observed that in glass painting one obvious requirement was, that there should be no large surface of any one unbroken colour. The object was to fill up, in one way or other, whether by black lines or by ornament, all the spaces, so that they should mould one into the other and yet have a line of demarcation; but there was no great mass of unbroken colour in any one part whatever. Therefore, in the example shown by Mr. Winston, a portion of a Jesse window, although the whole was cut up into small parts, it still formed an agreeable composition. In another specimen shown by Mr. Winston, the figures were made to occupy as much as possible of the whole space, leaving as little ground as possible dividing them; and he believed Mr. Winston could find that in his own design rather too much ground was left, the figures being too small. In the old works large and powerful masses of dark colour formed the predominant tints, to which the other colours were subordinate. In examining the various examples of different ages he had always felt that these were some of the principles which had guided the best painters on glass; and to a great degree the effect had been irrespective of the forms of any particular period. He believed the forms of any period might be made harmonious; provided these leading elements were adhered to with regard to the combinations of colour. Mr. Winston's design was an effort to get rid of the trammels which bound down modern artists. In France the art had recently been carried out very successfully.

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* St. James, from the Transept of the Cathedral, Florence.
Prophets and Saints, from the same place, ascribed to Francesco Gambassi, 1434, but certainly earlier.
St. Matthew and St. Mark, from the Choir, Lucca Cathedral. Ugolino da Pisa, 1489.
Virgin and her Child, from the North Transept, Sta. Maria, Novella, Florence. Alessandro Fiorentino, 1491.

Mr. **Winston** stated that in his own design he had given more ground round the figures purposely to counteract the spread of colour in the figures, which, it would be observed, were invariably coloured lighter than the ground of the panel. In the example shown from the Jerusalem Chamber the effect was not satisfactory because the figures were so crowded that there was not sufficient ground to cut them clearly out.

Mr. **Donaldson** was of opinion that there should be very little ground, but that that should be of a very deep colour. Glass painting should be treated like bas relief in sculpture. In the bas reliefs of the Parthenon and the tombs of the Greeks, especially of the later period, and in the Roman triumphal columns, the proportions of the figures were rather large and gross, in order to fill up the ground. This was necessary in order to produce fullness and richness of effect, and to prevent poverty of expression in the figures.

Mr. M. D. **Wyatt**, said that the principle in ancient art was to allow sufficient ground where poverty of action was intended, but where continuous and moving action was required, as in the Parthenon and Trajan's Column, they filled up the whole of the ground. The same law would hold good in glass painting, but for the swelling of the colour of the light parts. He therefore agreed with Mr. Winston that a larger proportion of ground was necessary in glass painting than in any other branch of art.

The Chairman (Mr. **Tite**, M.P., V.P,), observed that the want of success attending modern English glass painting, as compared with that of France, arose as much from a want of combination of colour as from a want of character in the design. Many costly attempts had been made in which the colouring was utterly inharmonious; and the want of character in the imitation of ancient glass was equally remarkable. In some recent cases, as at Ely Cathedral, the object appeared to be to copy all the ugliness of ancient glass; and he sincerely wished some of the ameliorations, proposed by Mr. Winston, might be introduced. The meeting were deeply indebted to that gentleman for his able illustrations of the subject, and especially for the elegant design submitted in illustration of his own views.

A vote of thanks to Mr. Winston having been carried unanimously, **The Chairman** addressed the meeting on the close of the Session, and said that he was requested to mention, for the purpose of obtaining the support of the members of the Institute, the fact that the Architectural Exhibition proposed to make another collection, which, he hoped, would be equal in interest to the one just closed. This collection would be opened to the public from the 17th December till near the end of February, and he trusted the gentlemen present would readily contribute drawings to an exhibition which had done so much for the advancement of professional knowledge, and which was so highly creditable to the profession.

The Chairman then begged to say one word in reference to himself. He had had the honour of opening the present Session of the Institute with some remarks which were received more kindly than they deserved, but which had led to another class of remarks, in which he appeared to have been misunderstood, and he wished particularly to refer to the latter, as he was exceedingly anxious to stand well with the younger members of the profession. In the outset of his address of the 11th November last, he had mentioned, in terms which he intended to be complimentary, *the Architectural Association.* He could really only repeat what he had then said—that he thought an association of that kind deserved to be encouraged, and he had done his best to encourage it. He had gone there at some inconvenience on a most tempestuous night, and felt much interested in all he heard. It was a step in the right direction, and the desire of the members for a diploma was, in his opinion, much to be commended. He was sorry, therefore, that anything he had said or was supposed to have said should have been misunderstood. Some gentlemen of that Association seemed to think that he had spoken slightingly of it, but he had no such intention. In early youth, his friend Mr. Donaldson, with himself and some other young architects had endeavoured to associate with similar objects, he therefore felt especially interested in the Association, and he only wished the members of it would do as he had done in subsequent years, that is, join the Institute, and thus constitute one body instead of two. He thought that suggestion was worth their consideration, and if he did not think well of them he certainly should not invite them to join the Institute. He regretted that he had been misunderstood, as he had a sincere regard for all young students, and especial sympathy for all who wished to embark in so difficult a profession as Architecture. (Cheers.) There was another subject to which he had ventured to allude at the opening meeting, namely, the cultivation of Mediæval to the neglect of Classical architecture, and he was extremely sorry that their Vice-President, Mr. Scott, was not present, probably in consequence of his engagement at St. Albans to-morrow. If he (the Chairman) had been sure that his other duties would have enabled him to attend this evening, he should have given that gentleman notice of his intention, because some remarks of Mr. Scott's had been read when he (the Chairman) was absent, in reference to the subject referred to, and had been issued to the members through the ordinary channel. On this communication he wished to make some observations, which he hoped and believed might not be unacceptable to the meeting. Mr. Scott's letter was called. "A reply to some remarks made at the Ordinary General Meeting, November 19th, 1855.'' Now, in that letter Mr. Scott remarked that—"In a society which supposes each of its members to hold his own individual opinion, and to express them freely as he pleases, it may appear unnecessary to notice mere manifestation of feelings which every one knows our respected friend entertains; but coming *ex cathedrâ* from the Chair of our Institute, and from our parliamentary representative, they may, if unanswered, appear to acquire more weight than belongs to them, and be viewed not as the feelings of an individual member only, but as those of the Institute as a body; in which case it would naturally become the duty of those who hold contrary opinions to make a formal protest, or to separate themselves from the Society.'' This passage contained two suggestions from which he (the Chairman) must dissent. He had the honour of representing a large constituency, but certainly not the Architects of England nor the Institute, and anything he might say there or in another place should only be received as the expression of his individual opinion. If he came forward officially as Chairman and stated that he was instructed by the Council to say this or that, the case would be different, but at the opening meeting he merely expressed his own opinions, opinions for which he held himself responsible, and with which the Institute as a constituted body had nothing to do. He repeated that he was not the representative of the Architects, but of another constituency, that he held himself responsible to that constituency but not to the Architects. To return to the question at issue he must be allowed to be again guilty of the sin of telling the younger members of the profession what he was most desirous they should learn, namely, that while they were studying Mediæval architecture they should not forget that there was such a thing as Greek or Italian architecture, and he could not enforce this point more than by reminding them that the Royal Academy medal had not been competed for, apparently in consequence of the study of Mediæval architecture having been pushed, as he thought, to a dangerous extent. He would not renew the vexed question as to which was the best style of architecture for modern purposes. He, as every other man, had his own opinion on that, but he would say as a Protestant, that a Protestant church ought to be convenient for the services for which it was intended; and it did appear to him that many modern Mediæval churches were not well adapted to the main purposes for which they were intended. In his former remarks he had quoted a high authority, that of Mr. Petit, and which he begged to quote again. Mr. Petit observed, "There are good reasons why we should rather make the best of our old churches, than materially alter them or destroy them to build others in their room: the impression they are calculated to produce more than compensates for some inconvenience in their form or arrangement; but there seems no reason why we should ever plan or build a new church of an inconvenient form, or in any way unsuited to our manner of worship. If, for instance, it is desirable that all the congregation should be within sight and hearing of the minister, why should a church ever be built in which a part of the congregation is hidden from him when he performs any part of the service in the usual place? And this must be the case in every church having aisles which terminate at the division between the nave and chancel. If we find that galleries are useful and convenient, why should we build churches that will not bear galleries, or to which they are a disfigurement? If we professedly adopt high-pitched roofs as suitable to our climate, why should we ever combine them in such a manner as to leave a lodgment for snow or rain? There may be difference of opinion as to the advantage of an unbroken area, or the expediency of galleries; still they serve my purpose in illustrating the proposition I would advance, which is, that an architect ought not to abandon a convenient arrangement on account of its ugliness, but rather try to get rid of the ugliness without giving up the convenience. If, then, a feeling that his first object is to make his building fully answer his primary purpose, and a determination that nothing shall be allowed to interfere with this object, be referable to a spirit of utilitarianism, I conceive that so far, at least, an architect ought to be a utilitarian." This was the end and aim of his (the Chairman's) argument. They should not be led by the desire of imitating ancient examples, however beautiful, into neglecting the infinitely more important object of public worship, or diminishing, by the character of the building, the convenience of the worshippers assembled in it. On the point of taste he thought his friend Mr. Scott had been a little uncandid with him. In objecting to Gothic churches in modern squares, he had quoted some instances in the neighbourhood of his own residence. These squares consisted of regular masses of houses elegant in themselves, but, forming one side of the square, an irregular Gothic church was placed, which had no fitness, and was inharmonious with the lines and masses of the houses, and, in his opinion, inconvenient internally for a large and crowded congregation. Nothing could be more elegant than a Gothic spire in the country amongst trees and fields, and irregular forms added to picturesque beauty, where it was not necessary to crowd many people into the building; but in London, where it was necessary to accommodate probably 1,500 people in a church, and where it was desirable so to place them that all might hear, niceties of technical detail should be forgotten, and utilitarianism and the real object for which the churches were built should be regarded. Mr. Scott had objected to him for suggesting as objects worthy of imitation the examples of the Romanists. This he did because that class of the Roman Catholic clergy who gave great attention to public preaching particularly connected architectural fitness in their arrangements. As evidence of this, take the great church at Pisa, built by Vasari, or the great churches at Florence: in them was found no heaping together of columns or tiers to interfere with the sight or sound. Preaching in most cases in the Catholic churches was only incidental, and at Milan and other places he had seen preachers ascend the galleries while large numbers gathered round them, but very few except those immediately near to the preacher could hear him. This was of less importance in Roman Catholic churches, because, as he had already stated, except in the case of the preaching friars, the sermon was considered incidental, and not essential; but in Protestant churches the congregation went as much to hear as to pray and to worship together. The deep and narrow chancels of Mediæval churches were also admirably adapted to the service of the mass, but not at all to the communion of the Protestant church, especially in the crowded parishes of London, where there were sometimes 800 or 900 communicants, who in such a building must be led up a few at a time, rendering a service, already too long for weak and delicate people, painfully longer. His friend Mr. Scott was one of the most able exponents of Mediæval architecture, and had executed many fine examples of it; but he could not help thinking that Sir Christopher Wren, in St. James's Church, Piccadilly, had produced a building internally far more appropriate and useful for a large congregation than Mr. Scott's elegant, but inconvenient arrangements. He did not wish to commit any gentleman to these opinions; but they were his own, and he thought an architectural "Tract for the Times" was wanted. They should do their best to restore ancient churches, and protect them from destruction; but a Protestant church in a city, for a large congregation, should be adapted to the wants and conveniences of the worshippers, and the peculiarities of the Protestant services. His object in these remarks was rather to set himself right with the profession than to invite any discussion of the subject, though he should be happy to enter upon such a topic if proper notice of it were given. He would merely add, that Mr. Scott had indulged in a little criticism respecting a Gothic church which he (the Chairman) had referred to, and in which, though elegant in itself, he thought the worst evils of the existing system were exaggerated. Mr. Scott availed himself of a misprint as to a date to be eloquent in his criticism; but it must have been clear, from the context, that he (the Chairman) was speaking of the time and style of Edward the First, and not of Edward the Third. Such criticism was therefore hardly worthy of the subject. The main point, in his opinion, was that a Protestant church ought to be built in the most convenient form for Protestant worship, and he contended that the Mediæval plans were not adapted to such purposes.

Mr. Jennings, Fellow, said that he had objected to Mr. Scott's paper being read in the absence of the Chairman, but was overruled by the Council. He concurred in the Chairman's views generally, but thought the fault of the frequent adoption of Gothic architecture rested as much with patrons as with architects. A Grecian or Roman design for a church would inevitably be rejected. It was most desirable that the question should be so discussed, that the public should be led to adopt a style in which seeing and hearing could be best provided for. A Grecian or Roman church would not be more expensive than a Gothic one. With regard to any discussion of the question, the Council had felt that it was likely to lead to irritation, and that it was better that each architect should act upon his own opinion.

Mr. Papworth, Fellow, said that after the reading of Mr. Scott's letter (which had been received by the meeting with silent astonishment) he had received an assurance from the Council that an evening should be fixed for the discussion of the question.

The Chairman said that Mr. Papworth's feelings, he was sure, had due weight with the Council, but he did not think any great advantage would be gained by a discussion of the subject at that moment. His own remarks had merely been by way of explanation. No doubt it could be discussed with advantage, and correct information might be obtained as to the relative cost and accommodation of Mediæval and Classical churches. Architects, like all who lived to please, " must please to live;" but men of taste could and should give a right direction to the public mind. Probably next Session they might enter upon such a discussion with advantage, and certainly without any ill feeling, and the recess would afford an opportunity for further considering it. In their foreign travels, during the recess, he urged the members to remember the Institute, and to glean information which might be useful to it, and especially to study foreign churches in relation to the religion of those countries, and their appropriateness to the forms of those religions. They should look with more kindness and courtesy to the services of the Roman Catholic church than was frequently displayed, and endeavour to understand them. This would enable them to come to the discussion of questions of this kind with a kindly feeling and in a Christian spirit.

Royal Institute of British Architects,

Incorporated 7th William IV.

Session 1855-56.

16, *Grosvenor Street,*
July 7th, 1856.

Dear Sir,

By direction of the Council, we beg to forward you the annexed Resolution, passed unanimously at their Meeting on the 5th instant.

"That 5 per cent. upon outlay has been, and is, the only rate of charge recognized by the profession, as fairly remunerative in the average practice of Architects.—That it is to be deeply regretted that it should be proposed to depart from the above rate in the instance of the New Palace at Westminster; a building involving in its design and execution the exercise of the highest professional attainments.—That the example which would be set by Her Majesty's Government, should the course proposed be carried into execution, (a legal appeal against their decision being practically impossible) is to be regarded as disastrous to the future prospects of Architecture as a liberal profession in this country,—as calculated to lower the character of public monuments in England, and unworthy the Government of a great nation, whose obvious duty it is adequately to foster and protect the genius of its artists."

We are, dear Sir,
Very faithfully yours,

C. C. NELSON, } *Honorary*
M. D. WYATT, } *Secretaries.*

PAPERS

READ AT

The Royal Institute of British Architects,

SESSION 1856—57.

USUI CIVIUM, DECORI URBIUM.

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BRIEF MEMOIR OF THE LATE COMMENDATORE CANINA, HONORARY AND CORRESPONDING MEMBER OF THE ROYAL INSTITUTE OF BRITISH ARCHITECTS.

By T. L. Donaldson, Hon. Sec. Foreign Correspondence.

Read at the Opening Meeting of the Session, 1856-7, of that Society, November 3rd, 1856.

When I undertook to bring before you the important subject of the description of the works, now carrying on from the designs of Mr. Salvin and the Signor Canina at Alnwick Castle, the seat of His Grace the Duke of Northumberland, I little thought that our feelings were to be saddened by the intelligence that we have recently received of the decease of the Commendatore, our Honorary and Corresponding Member, who has taken so great a part in these interesting alterations, and under the influence of whose living spirit I thought that my words this evening would be uttered. But he is no more! having died of congestion of the brain at Florence, on the 17th of last month, as he was returning to Rome after a lengthened stay in England.* A considerable portion of his sojourn here he had, by the special invitation of the Duke, passed within the hospitable walls of Alnwick, which he had visited in order to put into operation certain works for the internal decorations, that he had designed for His Grace; and the last three weeks he had lived under my own roof as my old friend and guest. Just before he left my house he put into my hand a letter, of which the following is a translation:—

Bolton Gardens, Russell Square, 22nd September, 1856.

To T. L. Donaldson, Esq., Hon. Secretary of Foreign Correspondence to the Royal Institute of British Architects.

Most valued Sir, and beloved Friend,

From your own house I have to make the request that, at the first meeting which will be held by the Royal Institute of British Architects, you will present vols. V and VI of my work upon the Antique Edifices of Rome and its Campagna, of which publication relating to the edifices of the city the first four vols. have already been transmitted, and which together complete the entire work. This, not only by its fulness, but also by the importance of the monuments illustrated therein in all their architecture may, perhaps, deserve distinct consideration, and that especially from being entirely executed by a not lazy artist, who only seeks to promote the study and progress of the best and most improved kind of architecture. Particularly anxious to act with the greatest possible concurrence in the views proposed by His Grace the Duke of Northumberland, and animated by the same desire, I beg to submit to the judgment of your distinguished Institute some of the principal perspective drawings of the internal decorations, which His Grace is about to have executed in his castle at Alnwick. He has, in pursuance of this intention, arranged that they should be sent to be exhibited at one of the first meetings, accompanied by a description drawn up by myself. These drawings have been made in a masterly manner by the architect Montiroli, whom I recommend to your artistic Institution. You were so good as to come to Alnwick in August last, and to examine carefully the proposed internal decorations. You will therefore be able, where necessary, to give more minute particulars of the work, as will also my most honoured friend Professor Cockerell, who accompanied you on that occasion. My object in the exhibition of these drawings is not limited to the wish of merely making known what has been decided to be carried out at Alnwick Castle, but to promote a more extensive application in England of that kind of noble decoration, which was the result of the studies made by our masters at the revival of the fine arts, in Italy especially, upon the most ancient monuments of Rome; from which circumstance this style became at once noble, and adapted to modern uses. To this general scope and purpose are particularly directed the intentions of His Grace, and worthy of consideration is the following paragraph in the last letter, which I received from Alnwick, dated yesterday: " *I pray you to present my best compliments to Professors Cockerell and Donaldson, and to assure them how sensible I am of their kindness in taking such a deep interest in this subject which I hold to be of national importance, that is to promote a more extensive system of artistic instruction in England in that style of decoration.*" The nation, as regards architecture, being well represented by the distinguished professional men composing the Royal Institute of British Architects, that body will be able authoritatively to promote the noble intentions of the Duke, as will also other influential personages already known by their patronage of the fine arts. I seize with pleasure the opportunity thus offered to me of renewing the expression of the sentiments of deep esteem and consideration, which I entertain for the members of the Institute, to whom I beg you will present them, and believe me, my dear sir,

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* By a letter from Rome, addressed by our Honorary and Corresponding Member Mons. Hittorff, to the Institute of France, "that the Commendatore had no one near him, no friend nor companion, at the hotel at the time of his death."

Your most devoted friend and servant,
L. Canina.

This letter shows the generous motives by which he was animated; a sincere respect for this Institute, to which he was anxious to present a complete series of his works—the desire to communicate to it as representing the arts in this country, a statement of the principles which guided him in carrying out the views of the princely owner of Alnwick—and that deep love of architecture which was one of the moving principles of his existence, which he wished to diffuse wherever he went, and as widely as his influence existed.

Instead, however, of immediately proceeding to the subject announced for this evening's meeting, I venture to think that I shall better consult the feelings of the members by previously offering a tribute of respect to our departed friend and colleague, the Commendatore, by submitting to your consideration a brief notice of that distinguished and remarkable man. I offer it not as an eulogy; for what eulogy can he require, who has been honoured by the highest distinction that this Institute has to bestow? the Royal Gold Medal. I offer it not as a vindication, for what vindication can be necessary for the literary and artistic character of an author whose best justification rests in the important works that bear his name? It is only as a hurried and therefore imperfect, but I trust not inaccurate sketch, that I venture to claim your attention for a few minutes to some observations, which I have endeavoured to keep untinctured by the indulgent predilection of too partial friendship.

I am not at this moment in possession of any authentic details connected with his early life and studies.* I can only relate what I learned from himself casually from time to time while we were together, and my own impressions derived from his works. He told me, that at the time I was in Rome pursuing my studies, between 1818 and 1822, he was engaged with Vasi the eminent publisher, who wrote various guides of Roman antiquities and of Rome itself. The name of Vasi is justly celebrated, as well from his Itinerary, as from being attached to very large and fine views of St. Peter's at Rome, which convey better than any other representations of that stupendous monument, an adequate idea of its vastness and majesty. The drawing and execution of these plates are perfect. The first important work of Canina, as an author, appears to be his History of Ancient Architecture, divided into the three series of Egyptian, Greek and Roman; the second edition of which consists of three folio volumes of 705 plates, and 9 volumes of text in 8vo. In this collection he presents the reader with illustrations of all the then known remarkable monuments of antiquity, derived from every authentic source with remarkable patience and judgment; and the text forms a most valuable resumé of all that has been written by various ancient authors upon this special subject. It thus affords a very complete source of reference to those whose studies are turned upon the history of ancient monuments.

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* Nagler, in the Künstler Lexicon, merely notices Canina as a Professor of the Academy at Turin, quotes his first work alone, and mentions that Pope Gregory conferred upon him the order of the Spur, now suppressed.

About the year 1842, he visited Turin, where he remained three months, and being invited to give his ideas upon a proposed new church to be erected on the site of that of St. John in that city, he availed himself of the opportunity to develope at considerable length his opinions of the proper form of a Christian church, which he conceived to be that of the early Christian Basilica, like that of St. Paul's without the walls at Rome; not that he intended to adopt the type throughout every minute detail, but to assume that form as the basis. Moved by this great predilection of his, the Signor Canina, under the auspices of H. M. Carlo Alberto, King of Sardinia, published in 1843 a folio volume, which reviews the history, distinctive form, properties and decorations of the ancient Roman Basilicas. He discusses the various theories to which the obscure description of Vitruvius has given rise; he then reviews in detail the several examples of the early Basilicas, analysing the several parts with their various uses, and not confining his illustrations to Rome, extends his enquiries to the individual erections of Constantinople, Ravenna, Aix-la-Chapelle (anc^t Aquis-Granum), Pavia, Milan, Palermo, Venice; and at the end he illustrates in several plates his own application of the principles, which he had discussed to the proposed Church of St. John, for which he had prepared a design in the Christian Basilica style with a large peristyled court in front.

I must confess, that valuable as I consider his learned researches on the subject to be, I cannot concur with him in his conclusions; for I do not consider the Christian Basilica a form adapted to a church, as it is meagre in its effect, producing an impression not at all equivalent to its size and cost. In the course of his text, he alludes to a very curious authority for the disposition of a church at that time, and the names of the several parts; it is St. Paulinus, who in his poems and in his letters to Severus, refers most frequently to these matters, and particularly describes the Basilica of S. Felice at Nola, of which city he was bishop, and the church of which he built A.D. 402 (Paulinus, Poemata, Natalis decimus).

Canina next devoted his studies to the immediate edifices of ancient Rome and the Campagna, and published four vols. of plates illustrating the former and two devoted to the Campagna, which were followed by a folio volume of type, as a topographical Exposition of ancient Rome. He then entered upon the investigation of the important monuments of the Roman Forum, a subject which had been distracted by the contentions of the rival systems of French, German and Italian antiquaries, and which had caused a strife that set all the archæologists by the ears. The drawings of this admirable production shew more of purity of style, profounder knowledge of the disposition of ancient monuments, and larger ideas, than any previous one of our author. He differs materially from the German school in his conclusions, making the length of the Roman Forum extend from the Capitol towards the Coliseum. The text accompanying these plates is a most valuable collection of the authorities who have treated on the subject. His next work was a topographical plan of the Campagna of Rome, full of profound research. He next turned his attention to Jerusalem, in a folio volume, entitled "Researches upon the Architecture of the Ancient Jews and of the Temple of Jerusalem," and then resumed his Roman studies by a folio work of 53 plates upon ancient Tusculum, detailing the Villas, the Forum, the Theatre, and other antiquities which still remain upon that classic site ; and always by his descriptions throwing new light upon the manners and customs of the ancients in reference to their edifices. This work was undertaken under the auspices of the Queen Dowager of Sardinia, to whose family Tusculum belongs.

But his researches were now to take in a more remote epoch, and to seek for illustrations in a field, which has since, within the last twenty years, been so fruitful of evidences of the history of the earlier inhabitants of Italy; and which have brought to light antiquities, such as cities, city walls, tombs, vases and other curious objects, dating prior to the foundation of Rome itself. The City of Veü has its folio volume of 45 plates, meant only for private distribution, and prepared at the expense of the Dowager Queen of Sardinia already alluded to. Ancient maritime Etruria is described and demonstrated, with its monuments, in four folio volumes and 136 plates. These works introduce us to arts, buildings, and other monuments revealing influences of Greek origin, and developing a school anterior to the earliest of any of the Roman buildings. Our indefatigable author next published a folio volume of 40 plates upon domestic architecture, applying the most graceful forms of all ancient people to modern uses. Thus carrying out his great endeavour to throw as much of the ancient taste as he possibly could into the various productions of modern times, he sought to influence the mechanical arts, so as to lead to a revival of antique forms, dispositions and proportions.

His last, and it may truly be called, his "Opus Magnum," consists of two folio volumes, containing the results of his excavations on the old Via Appia for a distance of six miles from the walls of Rome to Boville, with the announced intention of soon continuing his publication from Boville to Ariccia, and which doubtless he would have fulfilled, had he been spared to complete his grand scheme. Many of you will recall the vivid manner, in which our Vice-President Mr. Tite, on his return from Rome in 1855, described at one of our meetings the impressions produced on his mind, when, in company with Canina, he visited the successful results of his labours on the Via Appia. The tombs, the paved road, the mile stones, the villas, the Circi, the amphitheatres, the fora, and other important edifices, which the encumbered ruins, piled upon pile, were made to reveal to the labour and intelligence of our friend, of a scale little inferior to those, so well known to all of us, in Rome; not less rich in decoration, nor less novel in design—a mass of fresh inscriptions to illustrate still further ancient customs and ancient history. Such are the subjects of these two volumes, among the most important of modern times. The same plate shews in one part the shapeless masses of brick or tufo work, which were above the surface, or the mounds formed of overthrown fragments. In the other part of the sheet are revived the several monuments restored by the intelligence of the author and his assistants, with their marbles, their columns, their sculptures, and their domes ; and one seizes, as by inspiration, a conception of glories and splendour, of which the dreary Campagna had hitherto seemed to present no idea.

I have alluded thus cursorily to twenty-four folios of plates, and to ten or twelve of closely written 8vo. volumes of text ; but these are not the only fruits of his laborious researches and fertile imagination. He published an enlarged supplementary edition of Desgodetz, and wrote numerous very important papers, which are inserted in the "Annali dell' Instituto Archeologico" of Rome. I placed before him, while in England, my series of illustrations of antique medals, and he then mentioned his intention to compile a work on the architectural medals which represent the monuments of classic Rome; a subject which he had hitherto not treated with the weight that it deserved, his representations of medals, attached to his plates, being very loosely, and in some instances, very inaccurately rendered by his draughtsmen. He had it also in contemplation to collect the materials for a treatise on the ornamental parts of the domestic architecture of the ancients. Some of the fragments he had disinterred on the Via Appia, an accurate study of the paintings of Pompeii, with their fantastic representations of villas, alcoves, and slightly proportioned columns and other similar airy features, and the frescoes of the Thermæ at Rome, with various remains in the Roman Museums on the bas-reliefs, and the contemplation of the component parts of the candelabra that Piranesi had put together, compiled from antique fragments, produced the conviction on his mind, that the Romans allowed a licence of form and proportion in their domestic art, quite distinct from the severer rules of monumental architecture, nay, opposed to it. He conceived that from these "indicia" he could construct a perfect system of domestic decoration, at once light, plastic, graceful, and reasonable; and it was a great source of delight to him actually to find such a system constructively carried out in the Crystal Palace at Sydenham. Much as he disapproved, and with justice, of the total absence of artistic taste evidenced in its design, yet he visited it twice, with the express object of more definitely realizing in his mind the ideas which had hitherto been floating in it on that subject, without being able to conceive a precise natural mode of structural application, which the Crystal Palace seemed to offer. The development of this notion would have been a curious exercise for his ingenious mind, and we might have been taught by it to set greater store by the endless facilities which iron in its application to edifices affords, relieving us from the shackles of severe art to revel, not unreasonably, yet freely and untrammelled, in all the flights and fancies that the most poetic imagination could conceive, and justified by the precedent which antiquity itself offered.

The Commendatore Canina had travelled much throughout Europe, and had studied on the sites themselves the monuments of Sicily and Greece proper. His recent visit to England was the second that he had made to this country. His researches and labours were appreciated by many Princes and Sovereigns, and he was decorated with a profusion of Orders of various countries. But the distinction which he valued most was the position he held as Director of the Museum of the Capitol, and the title of Commendatore, which ranked him among the forty Nobles of Rome. This gave him just pride, as did also the Royal Gold Medal conferred upon him by this Institute, in 1849, with the approval of her Majesty and Prince Albert.

Like Piranesi and other Roman authors, he had the whole of the branches of publication carried out in his own house, in the Via Gregoriana. The type of his text was composed and carried through the press under his own roof; one room or more was occupied by draughtsmen and engravers; another contained the presses by which the engravings were printed; and, with the exception of one or two works, all were prepared and published at his own expense.

He was of early habits, rising, while in England, at five or six o'clock in the morning, and immediately setting himself to work, pen in hand. He was punctilious in his correspondence and obliging in his disposition. He undertook the engagement for Alnwick from no sordid object or intention of gain; but merely, as he took a formal occasion to assure Mr. Cockerell and myself, with the express and declared intention, full of generous disinterestedness, to carry out the wishes of the Duke of Northumberland for the promotion of art, and to do justice to his patron and friend the Cardinal Antonelli, by whom he was introduced to his Grace. He was very susceptible of criticism and opposition of opinion, and deeply resented the strictures of the German literati, who disputed his scholarship, and the critiques of the French, who called in question his taste. He was not free from the superstitious sentiments common to many of his countrymen, and, from an intuitive dread of consequences, would never allow his portrait to be painted nor his bust to be modelled. By a friendly stratagem I induced him to visit Messrs. Maull and Polyblank's photographic establishment, and after much persuasion prevailed upon him to permit his likeness to be taken, as one of the notabilities of the day. But it did violence to his feelings, and to avert the "malocchio" he arranged (as he thought unobservedly) the fingers of his right hand, as a charm against the evil consequence that he feared; a presentiment which the sad event of his death so soon after almost seemed to realise. The photograph, which I have the honour to present, faithfully represents the serious character and deep thoughtfulness of the scholar; but his expressive features, however, in moments of familiar and social relaxation, were often lighted up by a most pleasing smile.

His decease will produce a great void in Rome, where his acquirements and judgment were fully valued. His opinion was a high authority on all matters of classic archæology, and many an artist recognised in him a judicious adviser and patron. He was naturally reserved, and slow to form friendships, being distrustful of the depth of quick attachments; but, when once a friend, he continued so firmly and warmly, and thought no personal exertion or sacrifice too great to serve those he valued.

He was truly a giant in the archæological and architectural literature of classic antiquity; and however various may be the opinions of men upon his erudition and taste, all must agree, that he had great acuteness of perception on antiquarian subjects, and a very enlarged acquaintance with ancient art, for which he had the most supreme veneration, as also for the works of the masters of the XVth and XVIth centuries. Although occasionally influenced by certain deep prejudices, particularly in regard to Mediæval art, he has yet rendered essential service in the elucidation of the history of architecture. He has abridged the task of future labourers in that field of research, and left a body of information and instruction in his numerous tomes far beyond that produced by any other previous scholar. It would be difficult to find any more earnestly and disinterestedly devoted to the highest and noblest principles of our art.

It is a striking and touching coincidence, that Canina and Braun, the leaders of the rival systems of the two schools of archæological research in Rome, the Italian and the German, should have died within a few weeks of each other, and thus left the field open to other, but it would be bold to say to abler or more zealous, minds.

SOME DESCRIPTION OF ALNWICK CASTLE, NORTHUMBERLAND,
THE SEAT OF HIS GRACE THE DUKE OF NORTHUMBERLAND, K.G.

Compiled from Materials furnished by A. Salvin, *Fellow, the* Commendatore Canina, *and other sources.*

By T. L. Donaldson, Hon. Sec. For. Cor.

Read at the Ordinary General Meetings of the Royal Institute of British Architects, November 3rd and 17th, 1856.

This important stronghold formed a species of frontier fortress between Scotland and England, being only at the distance of about 30 miles from the Scottish border, and lying within 4 miles of the sea coast; it therefore commanded the high road from one country to the other. It is placed on a plateau, partly natural and partly artificial, midway up the hill, which rises from the River Alne to the South. On the West side is the principal entrance with its barbican, affording access from Alnwick. This town is attached to the castle, and is itself surrounded by a strong wall, and entered by gates, one of which, an old one, still remains in tolerable preservation, the two others now standing being comparatively modern. The fortifications of the town in their present extension are attributed to the second Earl of Northumberland, the son of Hotspur, about 1434; but doubtless so important a place, and one exposed to the continued incursions of the hostile Scotch, and the not very scrupulous raids of the Borderers, must have been surrounded at an earlier date by a circumvallation or some degree of fortification to protect the inhabitants from surprise, and enable them to resist for a time an advancing host.

The Mediæval castles of Great Britain may be divided into four classes: The simple fortified tower (a tradition of the remoter periods and similar to the outposts sculptured on the Trajan column) not of any considerable size, and yet sufficiently large to receive a small body of warriors, and afford accommodation for their provisionment and their arms. These may have stood singly, as towers of observation, to watch and harass for a time an aggressive force, and may have been surrounded by a temporary ditch, or a space enclosed by a stockade to receive cattle at night, or those of the countrymen near, in case of attack. They thus formed places of shelter even to the peasantry in times of danger. Such a tower was most likely the earliest predecessor of Alnwick Castle.

A second class of castles consisted of a large square donjon or tower, like those of London, Rochester, Richmond in Yorkshire, Bamborough Castle, Newcastle, and others, usually attributed to our Norman invaders. These were divided into several storeys in height, and each storey distributed into one or more central halls, and several chambers and galleries gained in the thickness of the walls. A fortified curtain surrounded them, enclosing a considerable space, with intermediate towers, and one or two entrance gateways, with barbican, and postern, and salley gates. Some of these, as at Rochester and Newcastle, received considerable architectural decoration in the interior, the mouldings being carved in the doorways, chapel, and halls.

A third class of castle consists of a central group of distinct towers of considerable size, surrounding a middle court, united by curtain walls, and each tower more or less extensive, according to the distinctive purpose for which it was intended; as the entrance gate with its porter's rooms and marshall or constable's accommodation, and with the prisons. Another was appropriated to the baron; a third to the baroness communicating therewith; a fourth to the officers of the household; a fifth to guests; and another to the hall, kitchen, butteries, cellars, and offices for inferior retainers. The whole formed in itself a position of great strength, enabling the chief, his warriors and family, when the outworks were in possession of the enemy, still to hold out, until the means of resistance or the patience of the besieged were exhausted. Of this class is Alnwick, as likewise Conway and Caernarvon, and the old Bastille at Paris. They were generally surrounded by extensive areas, like the previous class, consisting of what are called the outer or entrance Ballium or ward, middle Baily, and so on; but occasionally when attached to a town, as at Conway or in the case of the Bastille, these outer courts did not exist.

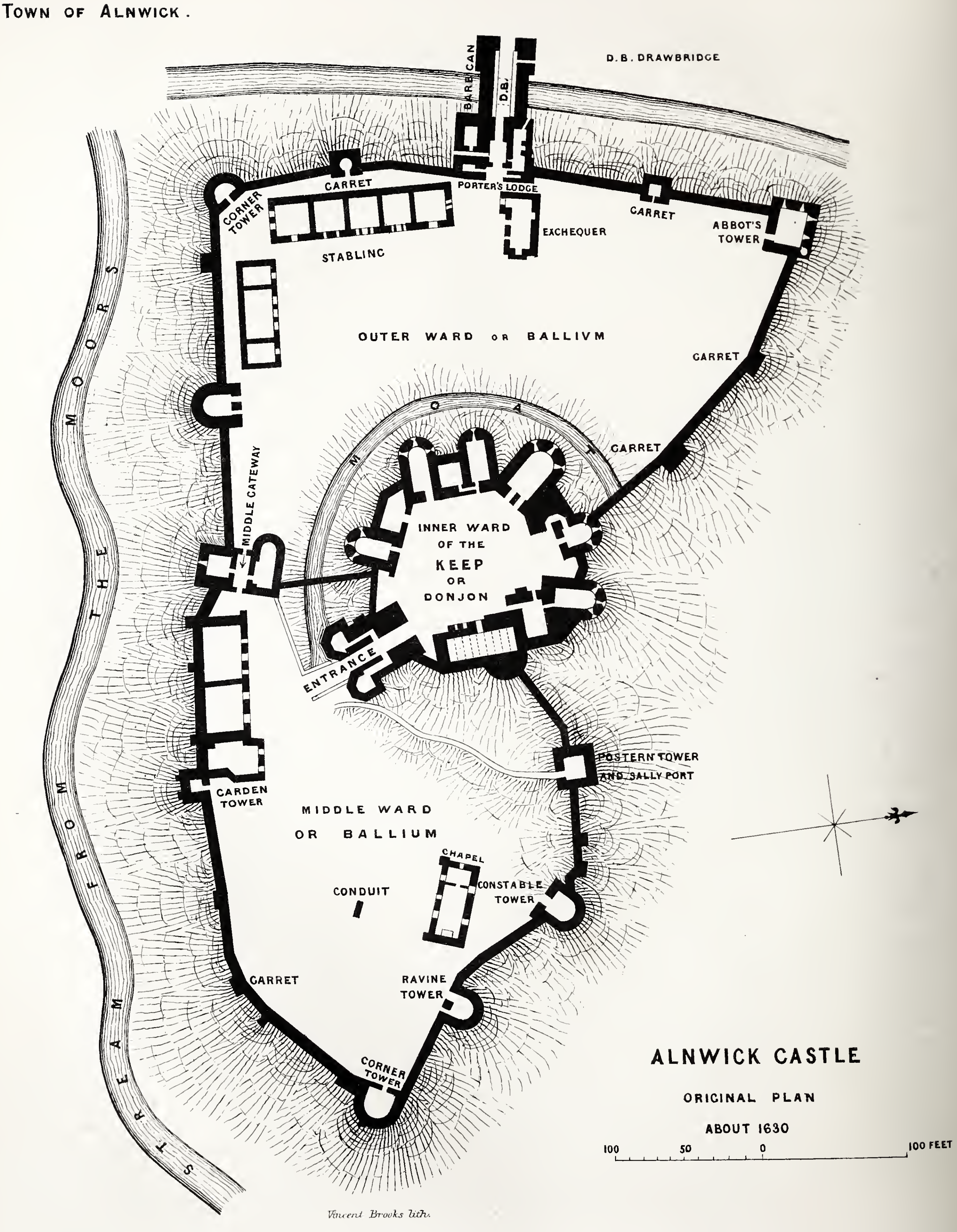
Our notice on castles in general should not stop here, and we may be permitted perhaps to notice cursorily another class, consisting of a large square or circular court, having a fortified entrance gateway flanked by towers, with circular towers at the angles or in the circumference of the precinct united by curtain walls, against which were attached within the court subordinated buildings for residence, and offices of all descriptions, and the whole castle surrounded by a fosse. Such is Barnwell Castle, near Oundle, in Northamptonshire, and Rothsay, in the Isle of Bute, N.B., both which are very interesting examples and deserve special study.

To resume, however, our history of Alnwick, for which purpose I avail myself of the elegant quarto volume, published by Charlotte Florentia, the present Dowager Duchess of Northumberland, illustrated by effective views, lithographed by Harding from her Grace's very clever drawings, and accompanied by text written by Archdeacon Singleton, which is the authority for the annals it records.

At the period of the Conquest, 1066, the Castle and Barony of Alnwick belonged to Gilbert Tyson, who was slain at the side of Harold. The Conqueror gave the granddaughter of Tyson in marriage to Ivo de Vesci, a Norman favourite, and the inheritance continued in the family till 1297, when it passed, in default of legitimate issue, to Anthony Bec, Bishop of Durham. The precise extent and features of the earliest castle under Tyson, it is impossible to ascertain; but it was enlarged by De Vesci, and it may be assumed, that it consisted generally of the parts now standing, varied from time to time as necessity or expediency required, and which we shall find involved changes in certain parts, though not so radical as to alter the general aspect.

The Castle consists of a central Keep, formed of a group of towers surrounding a court-yard about a hundred feet square inside. This keep is encircled by a considerable plot of open ground, divided into two large courts, both which served as "places d'armes" for exercising and manœuvring the troops, as we find drawn on the plans of about the middle of the 17th century, and probably in the outer one was a jousting ring and space for the tournaments, without doubt occasionally held here upon occasions of Royal visits. The whole contained about five acres within the walls, and was enclosed by a curtain wall fortified at distances by square and circular towers, with a principal barbican and entrance gate next the town, by which access was given to the interior of the fortress.

The Curtain is the construction of various periods, the earliest portions being considered to be those of De Vesci: and the courses, instead of being stepped up into horizontal courses, follow the varied surface of the ground, in curved and parallel lines, and generally there are no projecting footings to form the foundation. There are very obvious traces of the De Vesci walls quite distinct from those of his successors; and signs of reparations, alterations, and additions are apparent in various parts. The curtain wall did not at first entirely enclose the keep, one of whose sides to the N.E. next the river, at the part where there was a steep ascent, was exposed to the country; but after the report of Clarkson in 1556, who recommended the donjon being entirely disconnected and free from the park without, a portion of the outside ground was enclosed by constructing a curved curtain wall from the postern to the armourer's tower, and thus the keep was thereafter surrounded in its entire circuit by a continuous court. Originally, as we shall presently more particularly observe, the dwellings and offices for the retainers, and the subordinate domestic erections, were inside the outer and middle balliums or wards, but in more peaceful recent times they have been removed outside to give more space to the courts, and more freedom to the noble's dwelling.



ALNWICK CASTLE

ORICINAL PLAN

ABOUT 1630

Vincent Brooks lith.

We will now take our survey of the circuit of the castle, and enumerate the several parts, with some short remarks on each division of the subject, following Clarkson's description of 1556, and certain plans now in existence, apparently made about the middle of the 17th century. It may here be mentioned, that we have some very remarkable records of the condition of the castle at certain fixed periods, about a century apart.—A survey by Bellysis and others in 1537: Clarkson's survey in 1567, in consequence of which considerable works were done by Earl Thomas; and one of about 1650; and the middle of the last century is marked by the alterations under Hugh, first Duke of Northumberland.

The *Entrance Gate* from the town is preceded by a barbican or outer enclosure, like the city gates of York up to a recent date, which gave great strength to this part as forming the approach. There was the outer gateway opening into a narrow way between two lofty walls, so that if an enemy had passed the outer gate, the warriors could be hemmed in, and be here exposed to the weapons and missiles of the besieged on the walls above. Clarkson in his survey, 1556, states, that there was once at this part a drawbridge, for further security. It is evident that a fosse, or ditch, ran along this western face of the curtain. Then there was a portcullis and several pairs of wooden gates, as mentioned by Clarkson, and inside is the porter's lodge, as of old. The architectural features of this gate house and its barbican are very bold and striking, and the date may be assumed to be about 1350, at the time of Lord Percy, who added, it is supposed, some of the stone figures on the tops of the parapets. The only old figures are upon the middle gateway, and the half octagonal towers of the entrance keep, and are in quiet attitudes; but the later ones are in all sorts of violent fantastic action. This gateway is a very striking feature, with the two advancing turrets of rough stonework rising up to a noble height; the parapets pierced with embrasures, and surmounted by the figures in various attitudes; the return wall enclosing the narrow passage way, backed by the gatehouse rising above all, and by its frowning aspect forbidding approach to the foe. Clarkson notices this gatehouse as two storeys high, and as being in a very dilapidated condition.

Exchequer House.—Immediately within the gatehouse, or porter's lodge, and in the court, there was a large building, two stories high, named the exchequer house, but now not existing. It served for lodging, and possibly may have been appropriated to receive those strangers, whom it was not expedient or prudent to allow to enter the inner part of the castle. To the right hand, immediately within the gate, was another large two-storied building, the lower part appropriated to stabling for the horses of strangers or retainers, or common uses; the upper floor for grain. This Clarkson represents as having been recently built (1567).

Abbott's Tower.—Turning northward, or to the left, on leaving the porter's lodge, the curtain wall follows in a straight line from north to south for a distance of 180 feet, up to a large square corner tower, 40 feet by 30 feet, called the Abbott's Tower, and supposed to have served as a place to receive the Abbot of Alnwick Abbey, when that place was threatened or possessed by the enemy. Clarkson notices this tower as being, as it now is, three storeys high; the lowermost then occupied as an armoury. Between the gatehouse and the Abbot's Tower, the curtain wall has an embattled gallery all along, with parapets and embrasures, and midway between the gatehouse and the tower is a turret, sometimes, and now-a-days, called a garret, and, according to Clarkson, covered with freestone and two (houses) storeys high. These small interior garrets served as abutments to the walls, from the face of which they project, and thus afforded an opportunity to the warriors of enfilading the outside of the walls from tower to tower.

The Abbot's Tower forms a noble and commanding object at the angle, and rises up high above the curtain, with a turret at its outer angle, and its stone figures on the parapets. Thence the enclosure wall pursues another north-easterly direction, almost at right angles, but in a sweep, towards one of the lofty towers of the keep. In its course it is divided into three sections by two garrets, with a chamber in each. The two first divisions have battlements to walk upon, parapets, and embrasures; and the construction for some height above the ground is remarkable for some of the Norman construction, consisting of parallel courses of small square stones. The third division, next the keep, had no battlement to walk upon, a precaution probably adopted in consequence of its proximity to the keep, so that the top might not form a gangway, affording easier means of access to the tower of the donjon.

As this forms the conclusion of the curtain wall on this side of the castle, we must resume the survey of its circuit by starting afresh from the Porter's Lodge House, in the same manner as Clarkson. On the southern side of the Gate House, the enclosure wall proceeds southward for about 80 feet in a straight direction to a square garret or turret like the ones already mentioned rising above the wall, the lower part acting as a buttress to the wall, and the upper part forming a small circular chamber. In a slightly slanting direction the circuit wall runs 70 feet to the corner tower, which is circular with a square base, consisting of three storeys.

Audit Tower.—From this corner tower the wall pursues a direction almost due N. & S. At the distance of 120 feet is a tower called the Audit Tower, of the like form with the last, three storeys high, the lowermost serving as a stable, and the upper two as lodgings. Between these two towers was a garret like the former ones.

Middle Gate House.—At the distance of 85 feet from the Audit Tower and dividing the two wards, is the Middle Gate House, a building of considerable importance, three storeys high, and in some parts four. At one end it projects beyond the curtain wall, and covers an area of about 52 feet by 30, with a projecting circular tower next the keep; under it passed the roadway from the outer to the middle ballium or ward. It had on the left hand a strong prison, and on the right was a porter's lodge as at present. Above were the lodgings for the constable, with such conveniences enumerated by Clarkson, as the hall, kitchen, buttery, pantry and lodging for the constable and other gentlemen to keep house in, but since altered to the chapel.

Gardener's Tower.—From the said Middle Gate House, the curtain wall continues its course till it reaches a tower called the Gardener's Tower, three storeys high, the ground floor serving for a stable, the middle one for hay, and the upper one as a chamber. Between the Middle Gate and the Gardener's Tower, there stood against the curtain wall a building three storeys high, in length 35 yards, and 8 in breadth, the lower storey being appropriated as a stable for my lord's horses, and the upper storeys as lodgings for two gardeners, and attached to this was a smaller and a larger house and a garden. Between the Gardener's Tower and the tower at the angle, were two little garrets in the wall, the lower part serving as a solid buttress to the wall, the upper for privies only and covered with stone.

The Corner Tower at the eastern extremity was circular without the walls, and square on the face towards the Ward or Court. Clarkson states, that it was then raised no higher than the battlements of the curtain wall, and was two storeys high; but in the plan before you, it rises two storeys above the battlements. It subsequently became much decayed, and during the last century was taken down and rebuilt completely circular in plan, with two square projecting turrets, and three storeys in height, and is now called the Record Tower, containing the museum of Egyptian antiquities.

Along the outside of the wall, from the first corner tower that we have noticed, in the outer or first ballium to the second corner tower, there is a very lofty bank, now partially filled in, and at the foot of which ran a rapid stream, which brought the waters from the moors and formed a species of fosse to the castle. There is a walk all along the foot of the high wall from the Gardener's Tower to the Corner Tower, which having a southern aspect, affords one of the most agreeable treats to walkers along its sunny pathway; and from this circumstance was a favorite resort of Canina.

It will be perceived that the general contour of the outline of the external walls enclosing the castle precincts assumes, as it were, somewhat the form of an isosceles triangle, of which the entrance porch and its lateral curtains form the base 416 feet in length, and the two longer sides converging up to the present Record Tower, about 680 feet in length, taken in a straight line.

The Ravine Tower.—From the diverging point therefore of the corner Record Tower, the wall pursues a north-east direction and reached a tower called the Ravine Tower, not now existing, being at the time of Clarkson, "so rent that y^{t} ys mooche like to fall," it was subsequently replaced by a garret called Hotspur's Chair. This tower corresponded in importance with the largest of that class, the lower floor served for a stable, and the two upper ones for chambers; its form was round outside the wall, square facing the ward. The curtain wall thence makes a sweep to an angular tower, in form similar to the last, called the Constable's Tower. It rose three storeys high, the basement was used as a buttery, and the two upper floors had two fair lodgings. In the curtain wall at this point re-appear the Norman walls, with a subsequent construction above them.

The Postern Tower.—The curtain wall then takes another direction, and forms a re-entering angle, and runs for a length of about 60 feet up to a square tower, called the Postern Tower, with an intermediate small turret, or garret. This tower is three storeys high, and the basement forms a passage for the postern, and above are two fair chambers; at the base of the postern are remains of the Norman wall. From this Postern Tower the curtain wall went direct to one of the towers of the donjon or keep, being without battlement, parapet, or embrazures like the corresponding length near it, already alluded to. This length was destroyed in the middle of the 17th century.

Chapel.—" Between the Constable's Tower and the Ravine Tower, was a faire Chapell of vij yeards height of the wall, in length xix yeards and vij yeards of breadth, covered with slate, the windows well glazed, in all things well repaired (the seyling thereof onely excepted); betwixt the said Chappel and the said curteyne wall ys builded one lytell house of two house height, of length viij yeard; the nether part thereof called the revestry, the over part thereof a chamber wth a stone chimney, wherein the lord and ladie wth their children commonly used to hear the service. The same ys covered with slate, y^{e} loft thereof would (should) be repayred."

Conduit—" And before the said chapel door was a Conduit, built of stone and a cistern supplied with tryme and sweete water from one well called howlinge well, in pipes of lead.—(*Clarkson's Survey.*)

Between the Constable's Tower and the Postern Tower, was a brewhouse with all proper plant and fittings, and adjoining the Postern Tower a bakehouse; and near to them two houses, one for a slaughter-house, the other for stores; and there was a chancery house and a wood garth attached to the middle ward, in fact a complete series of domestic offices close in upon the keep. The keep itself was surrounded by a deep moat, which was dry; and the recent works have brought to light the retaining wall of the sloping ground next the keep towers. This moat was afterwards filled in, as we shall have occasion to observe.

The Keep or Donjon, as Clarkson calls it, formed a polygon, with a court yard in the centre, which was encircled by seven round towers and one square tower, under which was the gateway. The approach was by a drawbridge over the moat, and on either side, in advance, semi-octagonal towers, added by the second Lord Percy, about 1350, to the original square Norman tower. These semi-octagonal towers rise four storeys high, and contain on the entrance floor accommodation for a porter, and under the chamber, to the right, is a deep dungeon-prison, the only access to which is through the bottle-shaped ceiling by a trap in the floor, and there are loop-holes in the walls. The outer face of the archway next the court consists of a noble series of Norman mouldings, carved with enrichments, and there were originally two columns with their capitals on each side. Within the court, to the right, is a draw-well in the thickness of the wall, with three pointed arches, surmounted by one large discharging arch, forming a very picturesque object; beyond which is a doorway, leading into a vaulted chamber, called by Clarkson "a fayre vaulte, which is the butterye, in length xvij yards, in breadth vi." Above this "fayre vault" was the hall, approached by an external flight of steps, and over the hall was the peculiar feature of two chambers. In the tower next that of the hall were contained the kitchen, sculleries, buttery, larder, &c. The lord's and lady's lodging was over the gatehouse. The other towers contained the accommodation for the household. They were all detached, except in one case, forming separate dwellings, united by curtain walls for the purposes of defence. And again, to use Clarkson's own words, "uppon the sayde lead ys a trimme walk and a fayre prospect." "There is raysed on the west side of the said donjeone one lyttle square tower, called y^{e} watche towre, above the lead xiv yeard, wherein ys place for a watchman to be and a beaken to be sett or hung."

But there is one curious paragraph highly illustrative of the economy of the times, which we shall quote literally. "And because throwe extreame wind the glase of the windowes of this & other my Lords Castells and houses here in this cuntrie doothe decaye and waste, yt were goode the whole height of everie windowe, at the depart^{re} of his L. from lyinge at any of his said Castells & houses & deuringe the tyme of his L. absence or others lying in them, were taken down & lade appart in safetie; and, at sooch tyme as either his L. or any other sholde lie at anie of the said places, the same might then be sett uppe of newe, with small charge to his L. where nowe the decaye thereof shall be verie costlie & chargeable to be repayred."

We will now pursue the history of the Castle of Alnwick, with occasional reference to some of its Lords. As we have already noticed, in 1297 it came into possession of Lord Henry de Percy by a deed of conveyance, the original of which is preserved among the family muniments of His Grace, now in the charge of Mr. Williams, as Record keeper, who has most obligingly called my attention to this very valuable and remarkable record. It is from Anthony Beck, Bishop of Durham, who, it is said, always wore a suit of armour under his bishop's robe, and was called the fighting bishop. It bears date 19th November, 1309, and two days hence will be 547 years old. It conveys to Henry de Percy and his heirs the Barony, Castle, Manor, and Town of Alnwick, with the Towns, Hamlets and appurtenances thereunto belonging, with whatsoever else the said Bishop had of the gift of the noble Lord William de Vescy within the Barony aforesaid, and elsewhere in the County of Northumberland; and also the reversions of the dower lands of Isabella, widow of Lord John de Vescy the elder, and Isabella, widow of William de Vescy, expectant of the deaths of these ladies respectively.

The son of Henry de Percy defeated and took prisoner David King of Scotland, at Neville's Cross, where 15,000 Scotchmen fell. He constructed the semi-octagon towers to the keep, as an advanced work, put up stone figures on the parapets, and added the barbican to the entrance gateway, and many other works.

The great grandson of the first Henry de Percy was created Earl of Northumberland at the coronation of the wretched Richard II, and, after vanquishing the Scots at Hamilton in 1462, was himself slain at the battle of Bramham Moor, 2nd of March, 1407. His son was the valiant Hotspur, whom Shakespeare has immortalized, who was slain at Shrewsbury 21st of July, 1403, that is four years before, and the son of Hotspur succeeded to the grandfather's inheritance. He repaired the castle and fortified the town of Alnwick. Then succeeded the cruel and disastrous times of the civil wars, in which the Percys took always a conspicuous part, and paid with their blood their devotion to their allegiance for their sovereigns. The son of Hotspur fell at St. Alban's, and was buried in the Lady Chapel of the Abbey; his son was slain at the battle of Towton, and Henry Percy, the fourth Earl, was murdered in a popular tumult at Cocklodge, in Yorkshire.

Mr. Dick, in his Inscriptions and Devices in the Beauchamp Tower of the Tower of London, recently published, has the following remarkable paragraph in connection with this noble family, p. 28. "Immediately below the above names is the following inscription—

SARO : FIDELI :—
INGGRAM
PERCY
1537.
(I will be faithful, Ingram Percy, 1537).

During the year 1537, being the 28th of Henry VIII, we read of several rebellions in different parts of the country, caused through the great dislike, that was generally felt to the alterations, which were being introduced in the religion of the country. In the latter part of the above year several of the northern gentlemen joined in a conspiracy (Aske's) to oppose the measures, that were then being passed. Among others, were the two sons of Henry, the fifth Earl of Northumberland, (Sir) Thomas and Ingram Percy. This rebellion was quickly suppressed, and the authors of it apprehended. Thomas Percy was condemned and executed at Tyburn, the same year; but Inggram (the author of the above inscription) after being in confinement a short time, was liberated, and died in the latter end of the following year, 1538. The title and estates then seem to have been estreated for nineteen years, but were restored, in 1556, to Thomas, the grandson of the aforesaid Sir Thomas, and he became seventh Earl of Northumberland, by a grant of Philip and Mary. He executed considerable works to make good the dilapidations into which the castle had fallen during the period so disastrous to the family; and it was during this period that Clarkson's survey was made. The ravine tower was taken down, and the reparations and alterations carried out in pursuance of his report. This Earl seems to have maintained the faith of his fathers, not adopting that of the Reformation. He was beheaded at York, 22nd August, 1572, under Elizabeth, avowing the Pope's supremacy, and was buried in the church of St. Crux, outside which he had suffered, and his iron helmet still hangs suspended on the wall near his grave. His son and successor was found shot dead in the Tower of London, 1585, also during the reign of Elizabeth.

In 1632, Algernon Percy, the tenth Earl, succeeded to the inheritance; he was the Lord High Admiral of England, and had the charge of the children of Charles I, and during his life the large drawings appear to have been made, which give the plans and view of the castle with considerable accuracy, and enable us more fully to appreciate its actual state at that time.

Afterwards the castle fell into great decay, and at the time of Charles II, 1649-60, it is described by Ogilvy, the cosmographer, as "once large but now ruined."

WORKS BY HUGH THE FIRST DUKE OF NORTHUMBERLAND.

No incident of any importance is recorded as occurring in connexion with Alnwick Castle, from the middle of the seventeenth century till the middle of the last, when Lady Elizabeth Seymour, the heiress of this noble line, married Sir Hugh Smithson, Bart., who, on the death of his wife's father, Algernon Duke of Somerset, became the thirteenth Earl of Northumberland, and was created Duke of Northumberland in October, 1766.

In his time were executed, by Adam the celebrated architect, very important works, that materially changed the aspect of the castle. The chapel, and all the domestic buildings, which existed in the middle ward or ballium, were taken down, as also the exchequer house in the outer ballium near the porter's lodge, and the large two-storied building opposite to it; so that the two wards were left quite free and disencumbered of buildings, and the moat round the keep was filled in, and earth piled up high against the donjon tower and its curtain walls. Numerous domestic offices were erected outside the south curtain wall from the south west corner tower to the Garden tower.

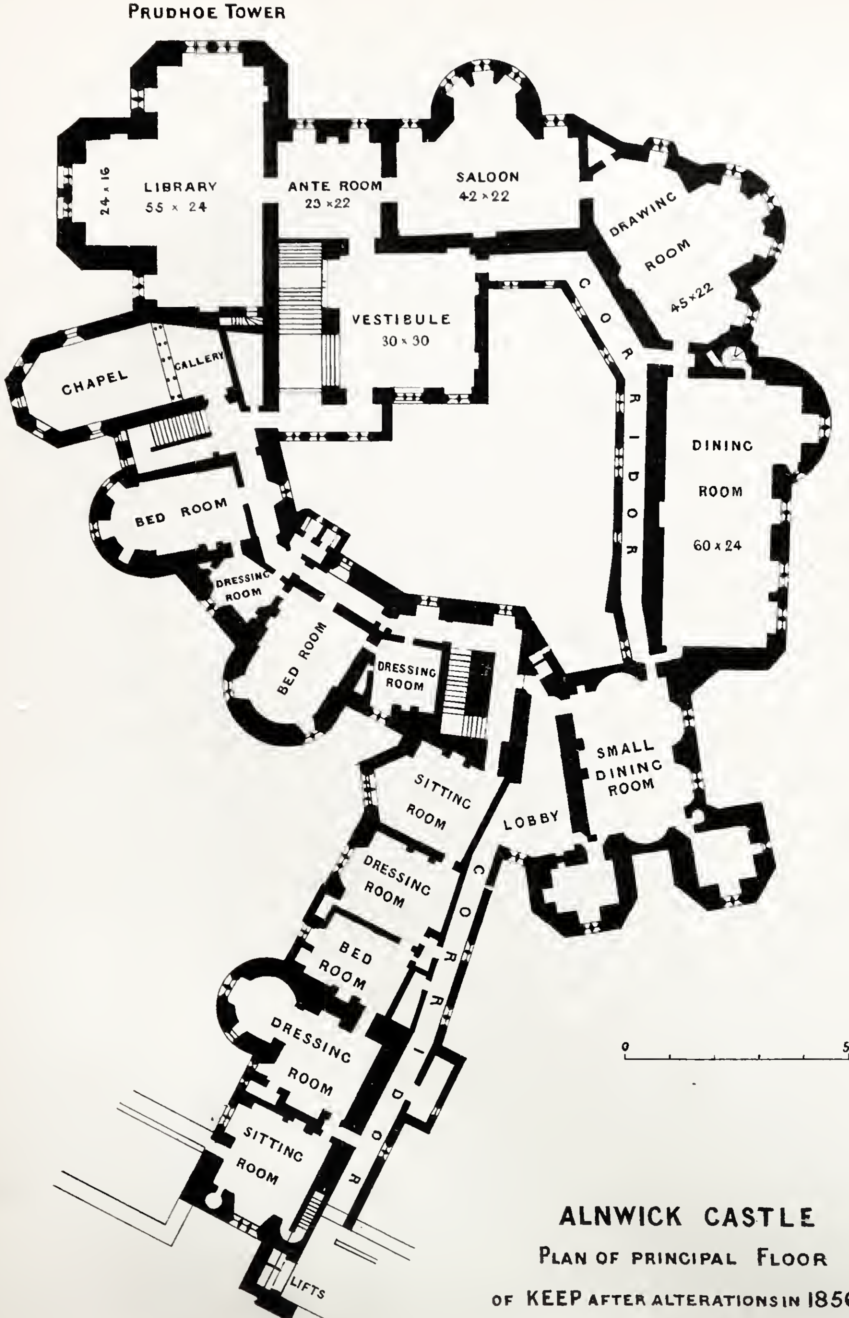
A large stable court was added, surrounded with stabling for forty horses, and coach houses with ample accommodation over. The easternmost corner tower of the middle ward was taken down and rebuilt perfectly circular, with two square external turrets.

The changes inside the keep were no less important. The towers, which hitherto had contained independant groups of chambers, with no connection between each other, and united only by curtain walls, were completely gutted, the inner walls carried into the court, and ample staircases and entrance hall gave access and communication throughout to the range of imposing rooms, which succeeded each other on the one pair floor, the entrance floor forming a species of basement, with the sculleries, confectionery, butteries, pantries and cellars. The middle gateway was connected with the keep by a wing building, which contained a suite of servants' offices; and on the other side of the gateway, next the curtain wall, was the kitchen and its dependancies. No great reverence was shown for the erections of other times, for in order to produce greater convenience, one of the easternmost towers of the keep was taken down and removed further to the south. The chapel, which had been pulled down in the middle ward, was replaced by converting the space over the middle gateway into a noble place of family worship, and it was approached through the library, that was over the servants' offices in the wing between the gate house and the keep.

There was an ample breakfast room over the gateway of the keep, and the semi-octagonal turrets still retained, as of old, their traditionary appropriation to the Duke and Duchess, by whom they were and are specially occupied.

There was the desire to retain the decorative style of the Mediæval times; but it assumed the taste, since so expressively attributed to Batty Langley; and in order to gain more light, the narrow apertures of the original times were widened, and the upper range exhibited a series of quatrefoils, which destroyed the sentiment of the earlier character of the castle. But still, although the sizes of the dining hall and reception rooms were spacious, and they were lofty in height, they were devoid of facility of access, one room often serving as passage way to the other. Such was Alnwick about 1780.

His Grace the present Duke of Northumberland, upon coming into possession of Alnwick Castle, found a great absence of domestic comfort and a deficiency in those modern conveniences requisite in the residence of a nobleman of his Grace's rank. The considerable transformation, which it had undergone in the last century, as we have observed, and in remoter periods, had caused it to lose many striking features, important parts having been reduced in size and consequence, depriving it of much of that original dignity and variety of effect, which it doubtlessly possessed in ancient times. His Grace therefore determined, to a certain extent, to remodel the plan of the central mass in a manner, that should combine modern conveniences in the interior with the castellated exterior character of the fabric. He desired at the same time to do away with the accidental tameness and insipidity of its outline, which it had seemingly acquired during periods of adverse treatment, and by increasing the altitude and prominence to certain leading masses, to give it that variety, grandeur, and due subordination of parts, which should convey the expressive sentiment of past times, when, as a leading frontier fortress, it seemed to frown defiance to its assailants, and to afford protection and a safe asylum to



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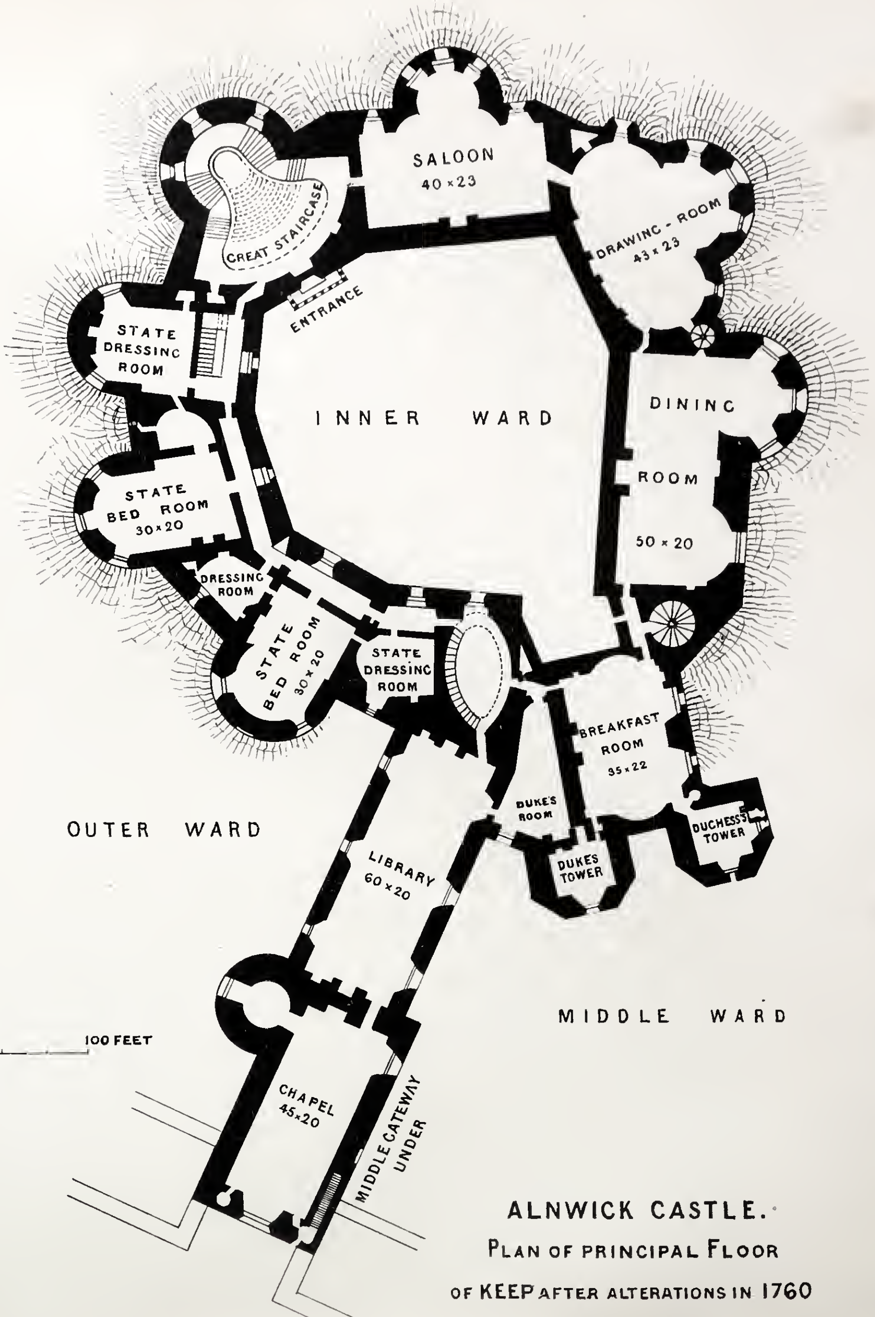
ALNWICK CASTLE

PLAN OF PRINCIPAL FLOOR
OF KEEP AFTER ALTERATIONS IN 1856,
BY A. SALVIN ARCHT



ALNWICK CASTLE.

PLAN OF PRINCIPAL FLOOR
OF KEEP AFTER ALTERATIONS IN 1760
BY R. ADAM, ARCHT

Vincent Brooks lith.

the many retainers, tenants, and dependants of the Percy family, and to the other inhabitants of the surrounding districts.

This task his Grace confided to the skill, the taste and experience of his architect Mr. Salvin, whose many works of a like nature offered the best assurance that the Duke's noble idea would be fully and worthily realised.

But a question of a more complicated nature, and less easy of solution, occurred, as to the treatment of the interior. Was the residence of the noble of the 19th century to reflect the stronghold of the baron of the 12th or 13th? Were the rude, though imposing arrangements and decorations of those periods, however dear to archæological associations and to historic precedent, to be repeated here? Would they find a response, a fitness to the refined manners, customs and feelings of our time? This appeared impossible. Yet to adopt the decorative fashions of the day,—the variable and transitionary tastes of the middle of the 19th century,—would be to sacrifice that innate and distinctive consequence and dignity, which tradition and a certain remoteness of period can alone give, and without which, Alnwick would be regarded merely as a toy and caprice of an individual, and a creation of the passing moment.

To surround himself with noble and imposing associations, was in his Grace's mind a duty he owed to himself,—to the line from which he was descended,—and to those who should succeed to a title consecrated in the annals of the country. This was a conviction to its fullest extent shared by the Duchess, and adopted as a leading principle by the architect, who was to take so important a part in the restoration.

With these impressions on his mind, his Grace visited the most famous palaces in Italy; and being in Rome, was much struck by the princely grandeur of the palatial residences of the titled families of that city, erected for men who took leading parts in the eventful political struggles of the most troublous periods of Italian history, and carried out by vigourously minded artists of the 15th and 16th centuries. Leonardo da Vinci, Michael Angelo, Raffaelle, Bramante, Vignola, Peruzzi, and others, whose genius was fostered and formed by the contemplation of the glorious productions of ancient art,—these artists were inspired by the grandeur of the Roman monuments, and produced works which, for breadth of effect, largeness of conception, and richness of detail, were worthy of being placed side by side with those, which they had studied with so much devotion.

It occurred to the Duke, that here was a fitting style for the interior of Alnwick Castle,—of a period to a considerable degree remote,—of a style not too familiar,—of a dignified aspect,—in size and treatment imposing,—yet not in any of these respects to such a degree peculiar, as to be at variance with our present usages, our present feelings, or inconsistent with the character of such an edifice. In point of execution the skill of the artists of the day and the perfection of the manufactures of the present period could worthily, and without any violent departure from their actual practice, reproduce the carving, the paintings, the stuffs and silks and hangings, in a manner not unworthy of the best period of similar decorations. At Rome his Grace found men well versed in the principles and execution of such a work, and addressed himself to the late Signor Commendatore Canina, whose studies and whose publications were the best guarantees, that the spirit and sentiment of the idea could be faithfully carried out; assisted, as he would be, by the pictorial and graphic skill of the Signori Montiroli and Mantovani, whose works were already advantageously known.

And eventually another patriotic purpose was to be carried out, which had its influence in all the operations of this vast undertaking. This was, that the native talent of the country should be made, and taught where unprepared by previous practice, to take part in every possible way in all the artistic and mechanical details; and that the marbles of the country should be made available, wherever they could be introduced. His Grace was seconded in this by the cordial concurrence of his architect Mr. Salvin, the Commendatore Canina, and his able assistants. Schools were formed,—the ablest artisans got together,—and rude skill made to acquire astonishing facility and tact of handling and treatment under the able instruction of the Signor P. Leone Bulletti of Florence, to whose talent is entrusted the execution of the wood carvings. Thus there will be established a class of native artists in this country, most rare, but hereafter ready to carry out the works of those, who may have the taste or spirit to introduce true and genuine art, instead of being satisfied with mere mechanical repetition.

Such is the basis of the conception of the *restoration* of Alnwick to its position among the noble edifices of the land, of which England may be justly proud,—baptised as it is with the noblest blood of its sons,—surrounded by the halo of past glories,—and endeared to the affections and respect of a happy and grateful tenantry.

It was of necessity that, adopting the Roman style, it should not have a merely foreign aspect, but be interwoven with the legends and ballads, the hills, the valleys, and the plains of the surrounding country,—the legacy of centuries past,—with the traditionary feuds of Border conflicts,—the many strifes and contests,—each of which has its recorded story in a thousand spots around the castle. That the stranger should never be unconscious, that he is in the castle of the Percys,—England's frontier stronghold,—whose history is a part of the annals of the country, and where a Hotspur, a Malcolm, a William the Lion,—the touching incidents of a Chevy Chase, and the catastrophe of a *Flodden*, have given it a renown second to no other in the realm. Its history was to be read upon its walls, and its traditions were to speak home at once to whoever should enter within its gates,—a task, as difficult as it was grave, demanding an entire devotion of every faculty, a perfect abnegation of self in all concerned in carrying it out.

DESCRIPTION OF THE STRUCTURAL OPERATIONS,

Read by A. Salvin, Fellow, Architect to His Grace.

After the able papers you have heard on this and a previous evening from Professor Donaldson, there is little of interest that I can add. But with your leave I should like to address to you a few words on the part I have taken in the alterations now in progress at Alnwick Castle.

In the Spring of 1854, His Grace the Duke of Northumberland wrote to me from Rome, desiring to have plans and interior elevations of the entertaining rooms (copies of which are on the table) that he might consult some architects at Rome on the subject. Soon afterwards, designs for ceilings, &c. were forwarded to England for the opinion of some of His Grace's friends. Beautiful as these drawings were, I had great doubts of the propriety, as well as practicability, of introducing Italian art into a Border Castle. My own wish would have been to devise Mediæval decorations to a plan consistent with modern requirements, and that would have accorded with the exterior as well as the associations of the place. I must here observe that I do not for a moment admit, what many opponents of that style urge against it,—that because the doors, the windows, and the ceilings are Mediæval, therefore the floors must be covered with rushes, and the furniture benches. It certainly was not the spirit of that style to be so cramped. The artists of those days availed themselves of the best the age produced, and the style will be most completely carried out in our present time by introducing all modern improvements, that will conduce to elegance and comfort.

In this instance, however, be it observed, none of the ancient features remained internally; and indeed the arrangement of the interior was so changed in the repairs of the latter end of the 18th century, that there was nothing of archæological interest to preserve; therefore whatever was done must necessarily be different from what existed in the old Border Fortress of the 14th, 15th, and 16th centuries.

His Grace having honoured me with instructions to prepare plans and elevations, my duty was to exert my utmost endeavours to arrange the best plan the nature of the structure would admit of, and to improve the external appearance by adding such features as it most required. At the same time giving every facility to the introduction of the designs of Commendatore Canina.

The foundation stone of the Prudhoe Tower was laid by the Duchess on the 25th of November, 1854, and by July in the following year it was, together with the entrance, built two-thirds of its height, as well as rebuilding the Dining Room, which had been found in too dilapidated a state to repair. 12,000 tons of new stone had been, up to that time, used in these buildings.

In the summer of 1855 the Commendatore Canina sent over Signior Monteroli, an architect, and Signor Bulletti, a carver in wood; the former to make drawings, full size, after the approved designs; the latter to carve samples to be taken to Italy to be executed, it being at that time intended that the whole of the ceilings and other decorations should be made in Italy.

His Grace having confided to me the general direction and execution of the works at Alnwick, it struck me, that not only the plain surfaces of the ceilings might be better done on the spot, but also some portions, at least, of the carvings, and that there was a most favourable opportunity for creating a school for carving in the Italian style. I found a person (Mr. John Brown) working for a cabinet maker in Alnwick, who showed considerable dexterity in using his carving tools. I gave him a piece of the egg ornament to copy, in which he was so successful, that I sought out others, and gradually collected a sufficient force from Glasgow, Shields, Sunderland, and Newcastle, in all twenty-one men and six boys, who are now executing the carvings, under the direction of Sig. Bulletti, with Mr. Brown as foreman, in a manner that will be a credit to the country and themselves. For any similar employment, I can with great pleasure and satisfaction recommend them to your notice, not only as able artists, but orderly and well conducted men.

On the walls there are plans and elevations of the castle as I found it: also, plans and elevations of the alterations now in progress.

By reference to the former plans, you will see a want of proper communication,—that the access to the Drawing Room was through the Saloon or the Dining Room,—that the Dining Room could only be approached through the Drawing Room, or by a circuitous route in the Bed Room Passage, and Breakfast Room. The Kitchen was also divided from the Keep, in which the Dining Room was situated, by an open archway, through which the carriages of the company were passing about the same time the dinner was crossing it. There are legends of patties having been blown about the court-yard. The Library was far removed from the other sitting rooms, so that after breakfast the company were separated, trusting to the next hospitable meal to bring them together again.

To obviate these defects and also increase the accommodation, I had to take down two towers. One to make room for the Prudhoe Tower, in which are the Library and the Great Staircase,—the other for a Chapel and a Staircase to the Bed Rooms. I had also to obtain a better Entrance, and, by projecting a corridor on arches and corbels, I gained separate access to the various sitting rooms, besides adding a picturesque feature to the exterior. The entrance is now from the covered Drive in the Inner Court into a low Hall, and thence, passing through the old wall of the Waiting Room, by a staircase 12 ft. wide, to a vestibule on the principal floor, 30 ft. square; from thence into an ante-room, with the Library on the left hand and the Drawing Rooms on the right: the Vestibule opens into the Corridor before mentioned, and so on to the second Drawing Room, the

Great Dining Room, and the Small Dining Room. The Vestibule also gives access to the Chapel, and the Passage to Bed Rooms on that floor, and the Staircase to the Bed Rooms on the upper floor. In altering the present Library into the Private Rooms of their Graces, I constructed a Passage across the Gateway, and at the end a Lift from the Kitchen, by which the patties may travel in safety.

These alterations caused no destruction of ancient buildings: for, on reference to a drawing, which shows the plan of 1630, distinguished by a light shade, from the plan of 1760, marked by a pink shade, you will see that many of the towers had been rebuilt in different positions. As, for instance, the Tower on the Drawing Room could not originally have been so near the Hall, because a Kitchen intervened. Neither could the original Tower west of the Octagon Towers of the Gateway have admitted the present Library, and a Dressing Room between it and the Gateway. There is also another proof of their modern construction. In pulling down the Tower where the Prudhoe Tower now stands, a bottle was found in the wall, containing the following inscription:—

"This Castle was built by Matthew and Thomas Mills, Master Masons, in the year 1764."

The mortar and masonry was also of a very different description from the old portions.

As far as my investigations go, I believe the only Round Tower to be that of the Dining Room, and this one was in a very dilapidated condition,—the outer shell good, but the lower portions of the interior built with mud, and further weakened by three windows, that had been cut through the wall in the alteration of 1760.

This tower has had the delicate operation (which you all so well know) of having its interior picked out and a new one put in, while its skin remains the same.

During the last two years there have been about 200 men employed, viz.—Quarrymen and Labourers, 42; Workmen's Labourers, 50; Masons, 60; Carpenters and Joiners, 16; Plumbers, 6; Plasterers, 6; Smiths, 10; Painters and Gilders, 8; Carvers, 27; Clerk of the Works and Foremen.

The building stone is from a quarry belonging to his Grace, three-quarters of a mile distant on Alnwick Moor. The steps are from Rothbury Moor, twenty-two miles distant. Each step is in one stone, 12 feet long, and the landings of one stone, 12 feet square. Stones of 30 feet square and 50 or 60 feet long may be obtained if required; its texture is very hard and of a beautiful white, free from marks or flaws.

DESCRIPTION OF THE INTERNAL DECORATIONS OF ALNWICK CASTLE,

Abridged from the Specifications of the late Commendatore Canina, Architect, Director of the Internal Decorations.

GENERAL ARRANGEMENTS.

It having been determined by His Grace that all the decorations should be executed after the best style of the first Masters of the 15th and 16th centuries in Italy, particularly in Rome; and that nothing should be done without his approval, the execution of the various works in stucco, marble, wood, and other materials, will correspond in style and character with the best Italian work of the revival by the ablest artists; commencing at the Entrance with simplicity, and increasing in richness of decoration according to the destination of the several apartments.

ENTRANCE ON THE GROUND FLOOR.

The *Ceiling* of stucco work to be simply arranged without ornament, and executed by ordinary workmen.

Walls.—The three arches on the side to have architraves, without imposts. The two doors on the side to be ornamented with simple bands. Between the doors to be placed a picture representing dogs, already painted. The three arches in the walls to be decorated simply like the preceding. The arch in the wall, where a window exists, to be ornamented in the same manner.

The *Fireplace,* in the same wall, to have a plain marble chimney piece; above which will be placed a picture, already painted.

Skirting.—At the foot of all the walls to be fixed a skirting of grey Bardiglio marble, without any moulding or considerable projection.

The *Pavement* to be made wholly of the white stone of the country, or of tiles.

APPROACH TO THE STAIRCASE.

The *Ceiling* to be decorated in stucco, and divided into three compartments with small bands or fascias.

Walls.—The three arches leading from the entrance vestibule to this approach to be also simply decorated in stucco, with architraves down to the floor, without imposts; with circular panels in the spaces above. Laterally, the two other arches will be similarly decorated.

The principal access to the staircase is flanked by two pilasters, which support an architrave or beam, by brackets attached to them. The pilasters to be lined with colored marbles. The soffit of the architrave or beam to have sunk panels.

In front of the two pilasters, and corresponding with the centres of the two lateral arches of the entrance to the staircase, will be placed two pedestals of grey Bardiglio marble, supporting candelabra, sculptured in white marble after similar works by the ancients.

The *Pavement* to be made of the white stone of the country, with the addition of some black squares.

STAIRCASE. GROUND FLOOR.

The *Ceiling* to be decorated with panels in stucco, with a little more ornament than in the preceding, and with a circular centre.

The *Wall* opposite the three arches, to be faced with colored marbles, with bands and compartments, of approved design ; and this decoration to serve also as a contiuuation for the imposts and as base to the grand staircase. Opposite the stairs, an arch to serve for the decoration of a window recessed in the thickness, before which will be placed a statue or a group in marble, in order to cover the lines of the window, which are not in harmony with the internal decoration.

The *Pedestal* or *Dado* to be likewise of colored marble, corresponding to the wall facing the entrance; and midway of this wall, will be placed two candelabra, similar to those before-mentioned.

The *Pavement* to be of the white stone of the country.

STAIRCASE.

The *Grand Staircase,* to be decorated above with three large arches, forming together the respective cross forms of the vaulting. The arches to be decorated with stucco in compartments, with mezzotints in the ground, in imitation of the Loggie of the Vatican. A similar decoration for the ceiling, and for the ground of the arches in the walls above the imposts.

The *Walls* will be lined with coloured marbles, as also the piers of the arches, finishing at the imposts.

At the head of the stairs, on the principal floor, the same decorations will occur, with panels to correspond with the other arches; the existing windows being reduced to a convenient shape to adapt them to the character of the internal decoration. In the archway in front, and in the opposite one, will be placed a balustrade of marble, with a large candelabrum, likewise of marble, on a pedestal.

The *Flights of Stairs* to be divided by a landing, with another at the head, from which five steps lead to the Vestibule or Hall on the principal floor.

All the steps and landings to be of the white stone of the country.

Flanking the rake of the stairs will be a base or spandril, from which rise the piers of the arches, having imposts and dado of white marble, with compartments of colored marble.

VESTIBULE OR HALL.

The *Ceiling* of this room, which is quite square, to be coved and executed with ornaments in stucco, painted. In the centre of the cove on each side a picture will represent a subject from Chevy Chase.

In the flat part of the ceiling a picture will represent some grand historical subject of the English nation, such as King John signing Magna Charta.

Walls.—In the wall next the staircase are two large arches, one gives access to the stairs, the other will have, as described, a balustrade and candelabrum in the centre, as in the one at the head of the stairs. On the side wall a large picture by Sebastian del Piombo, which His Grace possesses, will be placed in the position marked for it.

Frieze.—In the upper part an ornamental frieze will be painted with allusive ornaments on the sides.

The *Walls*, finishing at the imposts of the arches, will be lined with colored marbles, to carry round the decorations chosen for the pilasters and the walls of the staircase.

The *Pavement* will be formed of various marbles, with an internal band and small squares in the centre, to be sent from Rome with the other marble for lining the walls.

ANTE ROOM.

Ceiling.—This room which, is nearly square, will have a flat ceiling executed in wood, with regular forms, and decorated with ornaments in relief, painted. In the four angles of the ceiling will be painted boys connected with the picture in the centre. All the remaining decorations will be executed in wood.

A *Frieze*, with cornice and architrave, will be placed in the upper part of the walls; in the centre of the length of this will be introduced pictures of boys grouped, and on each side landscape pictures.

In the *Wall* the two windows will be reduced internally to a convenient form; and between them will be placed a sculptured chimney piece of coloured marble, ornamented at the sides with terminal figures.

Damask.—All the walls will be covered with satin of a green colour, of the height of 10 feet 6 inches.

The *Dado* will be executed in mahogany wood of a dark yellow colour.

The *Floor* to be of wainscot, covered with a carpet.

LIBRARY.

Ceiling.—This noble room, of a regular form, will be decorated with a flat ceiling in wood, carved and painted, with ornaments in the panels and compartments. There will be, besides, in each of the main compartments, a trophy allusive to the Arts and Sciences.

The *Walls* will be covered with two tiers of bookcases, a staircase in the thickness of the wall, leading to a gallery, giving access to the upper cases.

Bookcases.—The bookcases will be carved or wrought in maple-wood, polished, the decoration being applied to forms and depths the same as those of the bookcases in the existing library.

Pictures.—In the upper part of the walls portraits of the illustrious family will be placed, on a ground ornamented and painted red.

Windows.—A large window of two heights, which occupies one side, precisely facing the entrance into the library, will be reduced to a form convenient for the internal decoration. At the sides will be placed the lower tier of bookcases, and in the space above portrait pictures, as already stated. In the same sides will be placed two portraits, sculptured in basso relievo, by Sig. Macdonal, of Rome.

Fireplaces.—The three fireplaces in this room, will have chimney pieces of various coloured marbles, with simple ornaments proportionate to their relative dimensions.

Other Windows.—At the left of the entrance of this room, at the end, another large window of two storeys, crossed by the gallery to the second tier of bookcases, will also be reduced to a convenient form internally.

The wall fronting the large window will receive bookcases in two tiers, having in the centre the principal doorway marked with appropriate decorations.

Floor.—The floor of this room will be of wainscot, covered with a carpet.

SALOON.

Ceiling.—This room, for which the decorations were determined in the year 1855, is now far advanced. The form is regular, and polygonal in the centre, which occupies the interior of one of the circular towers of the castle. One portion of this ceiling was executed in wood with carvings, in August this year, to show the effect of the design made in Rome in the beginning of 1856.

A *Frieze*, with ornaments and boys on a red ground, painted in Rome by Sig. Mantovani, goes round the room, under the cornice, above which is a flat ceiling; below is an architrave, which also goes round the room; the whole forming a very rich and effective entablature.

Damask.—The walls will be covered with satin of a yellow colour, similar to Genoa tissue, of the height of 13 ft. 3 in.

Fireplace —On the long side of the room, in the centre, will be placed a marble chimney piece, executed in Rome, and decorated with two figures of slaves.

Doors.—In the centre of each end is a door, to be executed in the same style as the ceiling, having the same colours, and rich carvings on the panels and dressings.

Windows.—In the other walls the five windows will be decorated with archivolts carried by pilasters, within which will be painted ornaments, as also on the external part of the window shutters, to correspond with the rest of the decorations.

Window Curtains.—Rich hangings will be fitted to the windows.

The *Dado* will be of walnut-wood, from Italy, and of the height of 3 ft. 6 in.

The *Floor* will be of wainscot, covered with a carpet, harmonizing in design and colours with the rest of the decorations.

DRAWING ROOM.

The drawing room is of a polygonal form, composed of three sides, half octagonal, and one rectangular.

Ceiling.—A well studied combination of the polygonal form produces the decoration of the ceiling. All this ceiling is executed in wood, and at present the ornaments are being executed; these will serve as a model, both for the carving and for the decoration in colour.

Frieze.—The frieze is composed of ornaments with boys, on a blue ground, already painted in Rome by Sig. Mantovani; a carved cornice over it will serve as an impost to the ceiling, and a corresponding architrave will complete the upper part of the decoration.

Chimney Piece.—In the centre of the longest side of this room will be placed a chimney piece of white marble, with two canephoræ, which are being executed in Rome.

The *five Windows* round this room will have a decoration in wood, with pilasters and archivolts, and these will be painted with ornaments, as will likewise the shutters.

Damask.—All the walls will be covered with a red satin drapery, of Bolognese manufacture, from a drawing prepared for the purpose.

Dado.—In the part below a dado, like that in the preceding room, of dark Italian walnut.

The *Floor* will be of wainscot, covered by a carpet.

DINING ROOM.

The rectangular form of this room offers a good opportunity for regular divisions, according to a drawing executed in Rome in 1856.

The *Ceiling* will be carved, and left with the natural tint of the wood. A cornice, with modillions, crowns the walls; and underneath it a painted frieze, divided into pictures of allegorical or historical subjects, as shown in a sketch by Sig. Mantovani.

Damask.—The colour of the damask for the walls to be carmine red; the height about 15 ft.

Chimney Piece.—In the centre of the long side of this room a large marble chimney piece, composed of two figures, adapted from the most celebrated works of the ancients, agreeing with the remaining architectural decorations, but varying from all the other chimney pieces.

Pictures.—Above this chimney piece will be placed a large frame, carved to correspond with the ceiling and chimney piece. It will contain a picture, now in the present library. On the other side walls will be placed similar portrait pictures.

The *Dado* will be of choice wood, divided into panels, alternately plain and carved, of the height of 4 ft. 7½ in. The carving to be of the style of that in the choir at Perugia, and other similar examples. In the divisions of the parts above will be arranged ornaments, supporting cornucopiæ for lights, as well as two small candelabra above the chimney piece.

Doors.—To preserve symmetry it is proposed to place doors, two at each end of the room, with moulded jambs and entablature, the panels and mouldings enriched with carvings.

THE CHAPEL.

The decorations of this Chapel being in the Mediæval style, it is intended to introduce in the lower part mosaic decorations, especially in the parapet or fascia at the base of the windows; having compartments of Alexandrine work, like those in the ancient Basilicas, and in Westminster Abbey, composed of hard stones, such as porpyhry, serpentine, &c.

The space under this parapet, down to the skirting of the floor below, will have like decorations; but instead of "Pietre dure" they will be of Majolica.

The *Pavement* of the passage in the centre of the floor, and the space where the communion table is placed, will be arranged in divisions of mosaic, like the parapet under the window.

Such is the brief statement of the structural and ornamental operations of the most important class, now carrying on at Alnwick Castle. The style of decoration, that has been adopted, will, of course, admit of a variety of opinions among artists and men of taste; arising from education, predilection, and consequent habits of thought. But, it will be allowed, that the style has not been selected without much and deep consideration, and is justified by the precedent of all periods. And all must agree, that the execution of the work is being carried out with a grandeur of idea, a munificence, a considerate love for the arts and with a generous public spirit, worthy the characteristic nobility of the princely line of the Percys. T. L. D.

At the meeting held November 3rd, the Chairman, Mr. COCKERELL, R.A., and Mr. ASHPITEL, Fellows, bore personal testimony to the correctness of the eulogium contained in Mr. Donaldson's Memoir of the late Commendatore Canina.

The Honorary Secretary for Foreign Correspondence was requested to communicate to the Academy of St. Luke, Rome, the expression of sincere sympathy on the part of the Institute in the loss sustained by the decease of the Commendatore Canina.

Thanks having been voted to Mr. Donaldson for his Memoir, that gentleman then read the first part of a discription of Alnwick Castle. Mr. GODWIN, Fellow, suggested a vote of thanks to the Duke of Northumberland for directing the communication to be made to the Institute. The CHAIRMAN concurred, and said Alnwick was the Windsor of the North, and highly interesting from its historical and traditional associations. It was delightful to find that the Duke of Northumberland set a proper value on these interesting remains.

Mr. SALVIN, Fellow, stated that his Grace had no reserve whatever on the subject, and any information which could be brought to illustrate it was at the disposal of the Institute. The vote of thanks was then carried by acclamation.

At the meeting held Nov. 17th, after the paper had been read, Mr. G. G. SCOTT, V.P., Chairman, observed, that there were few questions attended with greater difficulty to the architect than the mode of dealing with castles. For the last half century it had been the fashion to build new castles; and, although Mr. Salvin had built the most complete one—a perfect model of a Mediæval fortress—that gentleman must excuse him for expressing his opinion that building castles was one of the greatest fallacies that could now be carried out. They were not necessary, as in the middle ages, and it was a great mistake to suppose that a building to be erected in the Mediæval style must be a castle. He most earnestly hoped that they had seen the last of *new* Mediæval castles. The restoration of *genuine* Mediæval castles was entirely another question. The examples which had come down to the present time were glorious remnants of the art, and of the noble thought of the artists of former days, who designed those structures with the greatest ability, and carried them out with a grandeur of idea and a nobleness of sentiment unequalled by the works of any age. These venerable relics deserved the most careful conservation, and in any alteration of them it would be right, as Mr. Salvin had done, to restore them, in all general features, to their ancient state. These buildings, however, in most cases were now occupied by noblemen who had not, as in former times, to defend the borders against a neighbouring kingdom. He agreed with Mr. Donaldson, or rather with the sentiments of the Duke, expressed by Mr. Donaldson, that a nobleman of the present day should not immure himself in a fortress, or live in a guard-room; but in going beyond that point, he thought it his duty, as representing, in some degree, the Gothic class of the profession, to say, that he believed there were others besides himself who would think the Duke had been mistaken in the rest of his logic. This difference of opinion, he (the Chairman), wished to express in the most tender manner. The Duke had been animated with the most noble feelings, and had called to his assistance an architect who, in the particular style in question, was one of the ablest in the profession; and he had also secured the aid of one to whom they owed much for the learned manner in which he had investigated ancient art, and the valuable works he had produced, and in regard to whom the greatest respect and tenderness of treatment were due, from the melancholy circumstances of the moment. There was not the least reflection on the judgment of Canina. He had carried out the works at Alnwick most admirably in the style which had been chosen; the only possible reflection would be upon the logic of the Duke of Northumberland, which had induced him to adopt that style, and consequently to entrust the work to the Commendatore Sinor Canina. His own opinion was that the art of the middle ages was just as capable of being applied to the wants of the present day, and particularly to the fitting up of Alnwick Castle, as the art of any other period. The great principles of decoration were the same in every style. Those principles arose from nature, and it was therefore quite compatible to carry out all that was required at Alnwick in the same style as the architecture of the exterior of the building, as in the style derived from the Renaissance Palaces of Rome; and further, that in doing so Mr. Salvin might have done much more towards carrying out and developing a style of our own than could possibly be done by carrying out the Italian style. It might have been possible to take up the spirit of that style in such a manner as to have formed a style of our own; and with all due respect for the noble and generous sentiments of the Duke of Northumberland, and more especially for the great abilities of Sinor Canina, he must repeat that he thought his Grace had made one of the greatest and most lamentable mistakes which had been made in the present day.

Mr. M. D. Wyatt, Hon. Sec., observed that Mr. Scott had alluded to himself as identified with Mediæval architecture in this country. Mr. Scott's sentiments, however, differed so much from the Mediæval spirit, and were so consonant with the spirit of our own times, that he (Mr. Wyatt) thought he should be rescued from such an accusation. Mediæval decoration was generally spoken of as if it were necessary that the precedent of our forefathers should be taken exactly as they had left it to us, In this country, neither sculpture nor painting had been developed in such perfection in Mediæval times as would be required now. A general code of grammar was an excellent thing; but he hoped that the Chairman and all those who advocated the revival of Mediæval art, would endeavour to disengage themselves from the rigid trammels of the past, and to fling away the shell, now that they were happily getting at the nut.

Mr. Pocock, Fellow, considered that the Duke of Northumberland had adopted the modern Italian architecture of the 15th and 16th centuries, because, in that style, the architecture of ancient Greece and Rome had in fact been reduced and adapted to modern wants. It was very different, however, with regard to Mediæval architecture and decoration, which had not been so modified at present; but which he hoped would be under the able hands of its professional admirers. A nobleman, however, seeing such an adaptation as the Italian style prepared to his hands, would naturally rather adopt it than attempt to carry out the Mediæval style, by which he might, without first having seen something executed in accordance with it, incur the risk of failure.

The **Chairman** explained, that when he spoke of the question as a mistake, he merely did so in an abstract sense, and not at all dogmatically. Holding, as he did, that Mediæval architecture was equally capable of adaptation to modern purposes as Italian architecture, he could not but lament that so magnificent an opportunity as the present, in the hands of one of the best Mediæval architects, should have been lost.

Mr. **Jennings**, Fellow, could not concur with the Chairman in the hope that castellated architecture might be abandoned. Its effect in scenery was very beautiful, and it might be applied with considerable success to the exterior of dwelling houses, and advantageously to prisons, barracks, and similar buildings. The subject had not perhaps been sufficiently considered.

The **Chairman** observed that he had only objected to the erection of modern fortresses, with battlements, loop-holes, and guard-houses, things which were not required in the present day. Such portions of a building, as doors or windows, which were necessary in all stages of society, might, of course, be executed in the Mediæval as well as any other style, with equal propriety.

Mr. **Donaldson** said, that the Duke of Northumberland, before adopting the Italian style, had satisfied himself that the restoration of English castles in accordance with the Mediæval style, from Windsor Castle downwards, had been a failure throughout. Not feeling satisfied with any of these restorations, his Grace considered whether any other style might be adopted, and he considered that the palaces of Rome of the 15th and 16th centuries appeared most consistent with our own habits and usages, especially as he was about to build on the large scale of those palaces, which was not generally the case in modern English works.

Mr. **Ashpitel**, Fellow, said, that it should be borne in mind, that the Duke had not to deal with anything like a Mediæval building which could be at all restored, but with one which had been actually ruined nearly a century ago. The works of that period were indeed so thoroughly bad that restoring them to their original state was totally impossible. Possibly the meeting might have entertained the idea that his Grace, having a perfect Mediæval building, had converted it into a classical one, which was far from being the case. The possessor of a true Mediæval castle should rather preserve it from decay, and apply it to such uses as it was really fit for, and, if he wished for an Italian residence, he should build it somewhere else, and carry it out in its integrity. Whatever notions might be entertained of the merits of different styles, it could not be doubted that a medley was always bad.

Mr. M. D. **Wyatt** suggested that, inasmuch as the Duke possessed a large collection of heir-looms, in the shape of modern pictures, he might properly have considered that they could not be shown to advantage in any room but one of a comparatively modern aspect.

The **Chairman**.—If the heir-looms referred to were at all connected with the Hotspurs and other early ancestors of his Grace, they would look better in a Mediæval room.

Mr. C. **Fowler**, jun., Associate, expressed his concurrence in the view taken by Mr. Pocock, as to the choice of the Italian style. Decoration generally in the present day was scarcely in a satisfactory position, as constituting any actual style of the period. Very few satisfactory specimens of revived Mediæval decoration could be found, and still fewer examples of ancient Mediæval decoration, and the Duke of Northumberland had therefore to choose between such a Mediæval style of decoration as he might be able to get, and the Italian style of decoration, which was ready made to his hand. Another material consideration might have been that, besides the original style of Italian decoration, there existed now a revived style of it, which had been carried into execution with great success in Italy and other countries.

The CHAIRMAN proposed the thanks of the meeting to Mr. Donaldson and Mr. Salvin. He concurred with the former in rejoicing to see a work of the great Canina in England, but he heartily wished it had been carried out at Northumberland House or Sion House, instead of Alnwick Castle.

Mr. ASHPITEL and Mr. DONALDSON adverted to the liberality and zeal of the Duke of Northumberland, in establishing with so much success, a school of art amongst the workmen of the north.

The vote of thanks was carried unanimously, and the Meeting adjourned.

ON THE VARIOUS METHODS, NOW BEFORE THE PUBLIC, OF INDURATING AND PRESERVING ARCHITECTURAL STONEWORK.

By C. H. Smith, Hon. Member.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, Dec. 1st, 1856.

Some years since the late A. W. Pugin pourtrayed, in his "Contrasts," the difference between numerous Mediæval and Modern edifices. That ingenious critic might, with equal propriety, have drawn a parallel between the present condition of the buildings of the ancient Assyrians, Egyptians, Greeks, Romans, and British people; he might even have included the Architectural works of London, previous to the beginning of the present century; nearly all of which, so far as the stone is concerned, are in a very perfect state as contrasted with many of the buildings recently erected in this country. The Architectural and Sculptural works of Nineveh and Athens, which are two or three thousand years old, are much less decayed than the stonework composing the Eastern Façade of Buckingham Palace, before it had been erected a thousandth part of the time. It may he said that the question is one of £. s. d., but all Architects specify and contract with the Builders, that "the whole of the materials are to be of the best quality of their respective kinds," and therefore when a client employs a Builder to erect a magnificent structure, he ought not to expect it to be in a perishing condition, like the Palace of our Sovereign, before its completion. When the Government ordered the enlargement of Buckingham Palace, it certainly did not entertain the most remote idea that Her Majesty would be inconvenienced by scaffolding, and a host of workmen to repair the defective stonework immediately after its erection; nor that, when repaired, the expensive process of oiling and painting would be resorted to, to avert the progress of decay in the new Caen stone, rapidly mouldering away.

I believe that the knowledge of the most fit and proper materials, according to circumstances, for constructing the exterior of our ornamental edifices, is better understood at this time and in this country than at any former period amongst any civilized people; yet, with all our advancement in art and science, the art and mystery of obtaining good and durable stone for our decorated Architecture never was in so low a state, and never was allowed to be so improperly practised. No material is so durable as always to retain its first appearance; the most solid and compact rocks have not such a degree of impenetrability, nor so close a union of the parts which compose them, as to be exempted from ultimate dissolution; there is scarcely a substance which does not exhibit proofs of "weathering," after having been exposed to the action of rain and atmospheric influences for a considerable time; it may be observed even on Granite and the most densely compacted siliceous rocks. The stonework of many beautiful buildings of recent date is in a worse state of external decay than that of others, which have borne the vicissitudes of summer and winter during six or seven centuries; in some bodies these changes are not so frequent and remarkable as in others, though equally certain to take place at a more distant period. Sooner or later all stone will decay; but whether the ruin be effected in ten years, or in ten thousand, is only a question of relative duration, somewhat in proportion to the labour of appropriation to useful or ornamental purposes, as the parts may be exposed to the weather either in large or small masses. The same influence is for ever at work, to bring about the disintegration, decay, and final dissolution of all things.

Of all the causes of decay in stone, none are more destructive than variations of temperature;

causing disintegration of the crystals or grains from each other by mechanical means. The vicissitudes of heat and cold, and of dryness and moisture, frequently alternating, are more ruinous to the carved parts of a building than either of these extremes constantly operating. However slight the additional heat may be to which a body is subjected, it will expand under its influence, and contract when the temperature is lowered. The thermometer will probably vary 100 degrees from the severe frost of a winter's night to the direct rays of an afternoon summer's sun, which never shines upon the north or north-east sides of a building, except very obliquely at rising and setting; but the south and west fronts have the same degree of cold as the north and east during the night, with the additional warmth of meridian splendour daily. Such extremes must tend to loosen the component parts and separate many small fragments from the surface, especially if the mass be made up of different substances, in which case some will expand and contract more, in proportion to their size and density, than others. The test of time proves this to be correct, for in almost all cases the greatest amount of disintegration has taken place where the inequalities of temperature are greatest.

Rain facilitates decomposition, or separation of the molecules by chemical means. If the stone happens to be of a quality likely to be disintegrated by frequent changes of temperature, and to be decomposed chemically through the influence of rain, it will very rapidly moulder away, should both these causes operate at the same time, or nearly so; by no means an unusual occurence.

An eminent political writer has remarked, that the very best laws are but necessary evils; because if everybody would do what is right and proper, there would be no necessity for laws of any kind. By the same mode of reasoning, if builders would do what they engage to do, and what is right, there would be no necessity for contrivances to prevent good stone from perishing; because no materials but those of the best quality would be used in the erection of a building. This refers especially to cases where a building has been erected with stone, supposed to be good enough to show no important symptoms of decay during a reasonable period, say the lifetime of the proprietor, the architect, or the builder. But to the annoyance of all parties, before the edifice has been eight or ten years in existence, large portions of the stonework may be gradually crumbling away; as is the case with the Ionic entrance to Hyde Park from Piccadilly, constructed with Portland stone; and the exterior of Henry VIIth's Chapel at Westminster, refaced with Combe Down, Bath stone. Such indeed is the lamentable prospective state of the latter building at this time, that there is every probability of its being, within thirty or forty years, in the same dilapidated condition as it was before the repairs in the year 1808, unless some plan be speedily adopted to avert the decay which I have repeatedly observed, with extreme regret, rapidly advancing on the exterior, in consequence of stone of an inferior quality having been used in its restoration. It appears therefore to me, that Henry VIIth's Chapel will afford an excellent opportunity to test the merits of the different inventions for preserving stonework; as there can be no doubt that the progress of decay is very far advanced in that beautiful structure.

Buildings constructed with first class stones, as Portland, Anston, and the best sandstones, ought not to require the aid of indurating processes to render them durable. No one ever thought of preserving the stone of St. Paul's Cathedral, of Greenwich Hospital, or of other public buildings erected in London during the eighteenth century. There is scarcely a trace of decay in the Portland stone of the Post Office, the National Gallery, or the Royal Exchange; whereas the lower part of the river front of the Custom House, the Ionic Entrance to Hyde Park from Piccadilly, and a few other buildings erected about thirty or forty years since, with a very inferior quality of Portland stone, are certainly in a decayed and dilapidated condition. The best specimen, in London, of Anston stone similar to that used at the Palace at Westminster, may be seen in the two elevations of the Museum of Practical Geology in Jermyn Street, and in Piccadilly. There is also an excellent specimen at the Amicable Life Assurance Office, No. 50, Fleet Street, the elevation of which is not extensive, but the stone is remarkably free from decay. The worst specimen may be observed in nearly the whole of the new buildings at Lincoln's Inn.

In all stone quarries, especially those occupying extensive districts, there are variations in the texture, hardness and durability of some of the beds, which may account for the stone from certain beds being more readily disintegrated when exposed to weather; thus rendering it objectionable for ornamental Architecture. In the Houses of Parliament, some such defective stones have been injudiciously used; but the proportional quantity of inferior stone in the entire edifice being small as compared with that of a good and durable quality, shows that the failures have arisen entirely from inadvertency, or the want of a more careful supervision of the blocks of stone, and of the particular beds from which they were obtained.

The first stage of decay in the Anston stone appears in spots of a lighter color than the general surface of the stone; these enlarge and unite until, in some cases, the whole surface acquires at a distance a pale yellowish brown tint. Upon closer examination, on the face, or more correctly speaking under an exceedingly thin film on the surface, there seems to be a sort of disruption of the particles, overcoming their cohesion, and a powdery incoherent light colored surface is the result. This is easily rubbed off, and it may probably, though not certainly, continue to increase in depth; for some few stones in the Houses of Parliament present unequivocal evidence of the surface having undergone a certain amount of decomposition, or disintegration, since they were finished by the workmen; but this progress of decay appears now to be at least retarded, if it be not altogether at an end. Upon this principle, it is possible that in many other cases the present mouldering appearance of certain stones may, at no very distant period, altogether cease.

It would be too much to expect so enormous a quantity of stone, or other natural product, to be all of a quality fit to receive the most refined elaboration, and without any defects; but a question may arise, whether there be more imperfect stone in the construction of the grand edifice just mentioned, than if some other well chosen stone had been used; Portland, for instance, than which no better material for such a purpose can be named; yet we find buildings constructed with this stone in various stages of preservation, some nearly perfect after being erected probably more than a century; but others mouldering away, only a few years after their completion, merely from want of proper care in selecting the material. These remarks will apply to the stone used at the Parliament Houses, but there are buildings in London and elsewhere, constructed with stone from the identical quarries which have furnished the material for the great work at Westminster, which present scarcely a trace of decay, while the surface of others, erected more recently, is to the eye even of the casual observer in a rapid state of disintegration.

The British Isles contain unbounded supplies of building stone, probably as good as any in the world. As it is usually on the surface of the ground in almost every stone district, it may be readily quarried at very little cost, and may generally be transported at small expense to any part of the kingdom. With these advantages, a foreigner might expect to find perfection in stonework in all our towns; our public and other buildings noble illustrations of this source of national wealth, proofs of the skill of our masons and carvers, and of the genius and refined taste of our architects, remaining from century to century in good preservation, deriding alike the frigid rains and scorching solar rays, without need of reparation. This however is, we all know, by no means the case; London and every other large town in our Island abound with examples of material badly selected, improperly exposed, often carelessly worked, and generally discreditable. I readily admit that there are numerous exceptions, but the rule is as I have stated; little or no pains are taken to learn the true relative value of different materials, but to save a small proportion of the first cost, some cheap stone is probably selected for Public as well as for Private Edifices; magnificent Club Houses, Royal Palaces, Churches, Chapels, and Cemetery buildings, that were intended to last many centuries, are constructed with the most perishable kinds of Caen or Bath stone; and thus, as time rolls on, we find ourselves surrounded with specimens, the greatest use of which now is, to serve as a warning for our future conduct.

Suppose a building to be erected with Caen, Bath, or some other soft cheap stone, that can be worked very expeditiously, and afterwards be hardened and rendered, at a very small additional cost, indestructible by weather and atmospheric influences; this sounds very tempting, and is no doubt a desirable object to attain. But it should be borne in mind, that the quality which gives Caen or Bath stone a preference among architects and workmen, the facility of working it, also contributes in a great degree to the speedy obliteration of its beauty when exposed to the weather; unless therefore the object can be successfully accomplished, the result must be a failure. There can be no difficulty whatever in rendering small specimens of soft stone completely weatherproof; but, as with numerous other projects, I foresee almost insurmountable difficulties in carrying out such contrivances upon a large scale, so that they can be practically applied, and completely answer the intended purpose in such buildings as the Royal Exchange, or the Palace at Westminster. Among other important advantages, the invention and mode of procedure should be commercially valuable; otherwise the cost of an edifice erected with soft stone, and afterwards indurated, may be greater than if the most durable stone had been employed in the first instance.

It is well known that water, even in its simplest state, acts as a solvent on most things; but when it contains acid, its power of dissolving calcareous substances is considerably augmented. The most perishable kinds of Caen, Bath, or Reigate stone, may be used for decorative purposes in the interior of buildings, where they are protected from the influence of rain or dampness, and may remain for centuries without showing any tendency to decay; but if the same stones should be exposed to the weather, all architectural features would be obliterated in the course of twenty or thirty years. The main object therefore to be attended to, in order to preserve stone from decay, is to protect it as much as possible from the influence of moisture, and especially from frequent alternations of wet and dry.

If water be one chief cause of the decay of stone, we must endeavour to saturate the stone with some solution that will repel the water, and thus become the means of conservation. Some years ago, the late Mr. Silvester suggested a process for the preservation of stone, cement, and brickwork. It was a solution of soap in the first instance, and afterwards a solution of alum. This plan seemed to answer very well at first, as the water thrown on the specimens flowed off without leaving a trace behind; but the effect entirely disappeared after a time, and the stone became as absorbent as ever. Another scheme has been tried within the last few years, under the sanction of several gentlemen, eminently distinguished for their chemical attainments. A solution was prepared by dissolving flinty sand and potass in boiling water, and called "Silicate of Potass" or "Water Glass;" with this the surface of stone buildings was to be saturated. It had long been known that animals and vegetables had the power of dissolving Silica in water; but it is only within a few years that the chemist has learnt to imitate nature in this respect, and to form an aqueous solution of flint. The acquisition of one really new idea in science is likely to give birth to others of far greater importance, and this "water glass" gave promise of the most successful results. Specimens of Caen stone and other soft materials, *soaked* in a solution of "water glass" in the laboratory of the Royal Institution, under the very able direction of the Rev. John Barlow, were very perceptibly indurated after a time, and resisted the action of water and of dilute acid; but having made a similar experiment, in the most careful manner, in the month of January 1849, upon a piece of Caen stone, which I knew to be of a perishable quality, and placed it on the roof of a building by the side of a piece of the same stone in its natural state, where they have remained until this morning, in order that they might be fully exposed to the action of the atmosphere and the climate, I now find that the silicated specimen and the unsilicated one are both in the same condition and equally corroded.

Some caution is necessary before experimenting on a specimen of finished work, because few fluids will remain neutral while in contact with stone; they will either preserve it, or in some degree decompose it. Their chemical action should consequently be accurately ascertained by well directed investigations.

Most of that numerous class of substances, which are of an oily or resinous nature, are insoluble in water, having little or no affinity for it and generally repelling it; they may therefore be useful in protecting other bodies from penetration by rain or moisture. It is well known that if wood is properly painted, or saturated with linseed oil, or linseed oil varnish, it will not readily decay or rot, but will remain unchanged in the damp earth, or exposed to the weather, as long as the oil continues to be of a fatty or greasy nature; whereas the same timber, in the same situation, rapidly becomes rotten without some such preparation. Nearly all the vegetable fats, which have the property of drying or hardening when exposed to the atmosphere, such, for example, as linseed oil, lose their unctuous consistency after a time, probably by evaporation, and dry up so completely as to leave nothing but a trace of resinous, waxy, or gummy matter. It is therefore absolutely necessary, in order to preserve wood from decay, to repeat the oiling or painting process every three or four years.

The first step towards investigating a subject scientifically, is to generalize the materials, and argue upon first principles. Without entering upon a controversy as to the merits of the various patented and other inventions for attaining the objects now under consideration, the remarkable similarity of each separate process, when compared generally with the others, is rather surprising. All the vehicles named in the specifications of the patents are composed of mixtures of oily, resinous, or bituminous substances. Now it is well known, that although the various oils differ from each other in certain respects, there are yet principles in them which seem to be common to all. Nearly every variety of fat and oil, whether of animal or vegetable origin, either the hardest tallow, the soft greasy fat of a horse or a goose, or the volatile oil of turpentine, may be separated into two distinct substances by compression or by cold. As regards fats and fat oils, that is those which do not readily harden and dry, one part, the oleine, will remain fluid, while the other part named stearine, at the same temperature, becomes solid; and this solid portion, in its chemical relations, is closely allied to wax. The volatile and essential oils, such as oil of turpentine, become thick by exposure to the air, and in time assume the character of resin. Bitumens gradually pass from a state of fluidity into one of viscidity and solidity. A long time is necessary to produce this alteration by the atmosphere only, but if heat be applied, distillation will carry off the fluid portion, and solidification will be much more rapid. Naptha, petroleum, mineral tar, pitch, asphaltum, shellac, and a certain portion of coal, appear to have had all the same vegetable origin, and vary but little in their elements and constitution from each other.

The following analytical table of substances of an oily or resinous nature, beginning with caoutchouc, which contains the largest proportion of carbon in 100 parts, and arranged successively as the quantity of carbon diminishes, will show that, notwithstanding the various oils and resins differ so much in appearance, they are all composed of a mixture of only three elements—carbon, hydrogen, and oxygen—and many of them are compounded in very nearly the same proportional quantities :—

	CARBON.	HYDROGEN.	OXYGEN.	
Caoutchouc	90.000	9.120	.880	100.000
Pitch	88.700	9.700	1.600	100.000
Oil of Turpentine	84.311	10.449	5.240	100.000
Naphtha	84.187	13.300	2.513	100.000
Wax	81.094	12.085	6.821	100.000
Tallow	79.420	11.580	9.000	100.000
Spermaceti Oil	78.303	11.491	10.206	100.000
Olive Oil	77.210	13.360	9.430	100.000
Linseed Oil	76.014	11.351	12.635	100.000
Asphaltum	75.000	9.900	15.100	100.000
Resin	74.773	11.809	13.418	100.000
Ether	66.475	14.125	19.400	100.000
Alcohol	52.175	13.500	34.325	100.000

The most conspicuous difference exists in the various temperatures at which the substances above-named become solid or fluid; for instance, most of the oils remain in a liquid state at the usual ordinary temperature of our climate, but at the freezing point, or a few degrees lower, they become solid. Pitch, wax, resin, and tallow are usually hard and compact, but melt at a degree a little above summer heat. These remarkable differences must be evident to a casual observer, yet I think I may venture to assert, that the most learned philosophers are not yet able to explain to a certainty why the same elements, united in the same proportions and at the same temperature, should give liquifaction in one case, and solidification in another. It is also well deserving of notice, that all these substances appear to be, as it were, of one family, possessing a sort of chemical affinity, or general good feeling for each other's company; for example, if we take any two substances named in the foregoing table, and put them together at a certain temperature, they will unite and form one homogeneous body; still further, I am of opinion, that if the whole collection were to be thrown into a cauldron, placed over a gentle fire, there would soon be a hotchpotch of a uniform texture, somewhat resembling treacle in appearance. There might be individual exceptions, but I believe the rule would be as I have stated.

Many plans have been practised, or tried experimentally, by different persons during the last few years, in order to get over the necessity and expense of oiling a stone building periodically, for the purpose of averting the progress of decay. To generalize and describe these contrivances in a few words I may say, that the patentees have found that oil, in its simplest state, applied in sufficient quantities to saturate the surface of stone, loses by evaporation nearly all its protective influence in a few years; they have therefore adopted the plan of charging the oil with an additional quantity of the solid portion of the same, or of any other kind of oil, such as a mixture of oil and wax, resin and turpentine, or of naptha and shellac. During the process of saturating a porous stone with any of these mixtures, the fluid holding the solid wax or resin in solution acts as a vehicle to carry the wax or resin, by capillary attraction, into the interior of the stone; and after the fluid portion has evaporated, the solid which remains serves two purposes; it protects the stone from external wet and moisture, which always tends to decompose soft lime-stone; and then the solid wax or resin serves to cement the grains more firmly together, and thus changes what was previously a fragile absorbent substance into a compact stone, impervious to moisture, so far as the indurating mixture has penetrated.

The first patent for indurating and preserving stone which I shall notice was granted to François Teychenne, a foreigner, residing abroad; it is dated February, 1847; it afterwards became the property of William Hutchison. I believe the works are now carried on at Tunbridge Wells, and the patent belongs to the "Indurated Stone Company." In general terms the operation may be thus described: the stone to be indurated must be worked to the requisite form, then thoroughly dried in a heated chamber, or by some other convenient method. The solution, in which the stone is to be immersed, is composed of resin dissolved in turpentine, oil, wax, tallow, or other fatty substance; the materials are to be melted in a boiler of suitable size, and while they are in a state of ebullition the stones are put in, and the operation of boiling is continued until they are inpregnated to a sufficient depth from the surface; in ordinary cases two hours boiling will impregnate the stone one inch.

The next invention for a similar purpose, patented by Barnabas Barrett, is dated October 1853: it is now worked in the name of "The London Stone-Hardening and Preserving Company;" their office was at 41, Moorgate Street. The following is Mr. Barrett's mode of procedure: the stones to be indurated are first completely worked to their required form, then placed in a chamber or oven, which is heated from 50 to 60 degrees, to drive out whatever moisture they may contain. In all cases where it is practicable, the stones are to be operated upon in an air-tight chamber, exhausted, or partially so, and then the indurating mixture, whether hot or cold, is allowed to trickle down or flow into the chamber to fill the vacuum; the effect of which will be that the liquid indurating substance will readily find its way into the pores of the stone, and become incorporated therewith. Mr. Barrett's indurating mixtures are classed under six varieties:—the first is composed of resin dissolved in naptha, spirits of wine, or turpentine, mixed with gutta percha, dissolved in coal tar naptha, and when warmed with steam heat, mixed with oil or any other greasy materials; after which "anti-corrosia" is ground down and well mixed with the above. Another mixture is composed of unslacked lime, with oil or soft soap, and Russia tallow, mixed with it whilst slacking; when well slacked to be placed in a copper with alum water and "anti-corrosia," ground-up copperas and a solution made from potatoes, and beer settlings: when well boiled and mixed together, they are left to settle, and the solution is drawn off. These various preparations are rather complicated, I will therefore not occupy more time by going further into Mr. Barrett's inventions.

The next patent for the same purpose, granted to John Benjamin Daines, is dated April, 1856. The specification describes the invention as "An improved mode of treating surfaces of soft and porous stone, &c. for the preservation of the same from decay." Mr. Daines' chief object is to impart to the exterior surfaces of stone or compo buildings, the power of resisting the destructive effects of the atmosphere and of damp; and in some measure to neutralize the tendency to alkaline efflorescence. To produce these results, he first applies a solution of sulphate of zinc or a solution of alum; after which, sulphur dissolved in linseed or other oil. This mixture is to be laid on the surface of buildings, or building materials, by the aid of a brush, or by meams of an exhausted case applied to the wall of the building, or by any other suitable means; the stone will then be impervious to moisture.

Mr. Henry Clinton Page took out a patent, dated May 1856; part of which is for "indurating common stone work generally," for this purpose he dissolves bees wax in coal tar naphtha. But if the color of the stone be very delicate, or the preservation of its natural color be desired, Mr. Page substitutes double distilled camphine in place of the coal tar naphtha, and white wax instead of common bees-wax. The solution is to be applied with a brush to the surface of the stone, repeating the process as often as the stone will absorb it, and until the pores are completely filled therewith; using the solution thicker for coarse grained than for fine grained stone.

Having given an abstract of four distinct patents for attaining the same object, I will now endeavour to give a general view of the mode of operating, and of certain practical difficulties attendant thereon. Every one practically acquainted with the working of stone, whether as a mason or a carver, must be well aware of the time occupied, and of the liability to damage incurred in removing heavy masses of elaborately wrought stone after the work is finished; and that the risk of injury or breakage is far greater with soft than with hard stone. In several of the patented inventions, it is expressly stated that the stones, after being completely worked, are to be thoroughly dried in a hot air chamber, or oven; and in one instance it is stated, they are afterwards to be put into a tank of boiling solution, and boiled for several hours; in another method the stones are to be put into an air-tight chamber, exhausted, or partially so, and then filled with the indurating mixture, either hot or cold. I need scarcely state that it is an utter impossibility to exhaust, even partially, a vessel capacious enough to hold the largest stones that are generally used in a first class building. The failure of the atmospheric railway, on the Croydon line, arose entirely from the impracticability of exhausting large vessels, as it was found impossible to make them anything approaching to air-tight. If the stones are to be completely immersed in the indurating mixture, there will be great waste, as no other part than that which is to be exposed to the weather need be indurated; in fact the joints, beds, and back being covered with an oily or resinous substance, will prevent the mortar or other aqueous cement from adhering properly to the stone; and the result must be a certain amount of weakness in a building so constructed.

Among the writings of various patentees I find the remarkable statement, that "the process gives to the most porous stone, the hardness of primitive granite." It will be unnecessary to expatiate on this imaginary result—we will look upon it as the infatuation of a parent for his offspring. The same patentee attributes the decay in stonework to alkaline efflorescence, arising from the cement or mortar used in the walls; he has arrived at this conclusion after a variety of tests and trials during eleven years. These are assertions, but no proofs are offered. The gentleman has no doubt seen many examples of stone in an advanced state of decay, covered with a saline or alkaline efflorescence; but is he prepared to show, by experiments, that the same stone would have remained perfectly free from disintegration, had it been situated far from the influence of what he conceives to be destructive agents. I have submitted a piece of limestone, which I knew to be of a good and durable quality, to the most severe tests of both salts and alkalies, trials far more powerful than anything likely to occur to stone in the ordinary course of nature, yet with all such violent experiments, I have never been able to produce more than a mere trace of alteration or disintegration; I am therefore disposed to believe that the salts and alkalies have little or nothing to do with the decay of stone. Among the published writings of patentees I find also this remark, "in many cases the decay of stone is accelerated by the employment of sea or salt sand; a proof of the destructive effects of salt upon stonework, may be observed in any sea port town." No doubt the author has observed stonework in some sea port towns in a deplorable state of decay, many of the buildings at Brighton, constructed with Portland stone, are in this condition; but we have no "*proof*" offered that such decay is occasioned by marine influence. The surface of the masonry of most of the buildings at Oxford is so decomposed, that it is peeling off like paper or rags. Had this beautiful city been erected with the same stone, on the sea coast instead of the interior of the country, many might have imagined, that the wretched condition of the stonework was entirely owing to the destructive effects of sea salt, whereas it is the result of bad stone.

The Island of Portland is only five or six miles in circuit; of course it is surrounded on all sides by the sea; it contains seven villages, all built with Portland stone, and they are in an excellent state of preservation. But the most remarkable instance, which proves that sea salt has no effect whatever on good stone, is that of Sandysfoot Castle, near Weymouth, built with Portland stone in the time of Henry VIII. It is so close to the sea, that every high tide washes the lower part of the walls, and in stormy weather the building is completely overwhelmed by the spray, yet the stone is quite perfect, and the chisel marks are as fresh as when left by the workmen. The fact is, *good* stone will remain nearly perfect in any situation, during almost an indefinite period; whereas *bad* stone, if exposed to the weather, will rapidly moulder away, whether placed on the sea shore, or in the middle of a large continent. The four patents which I have described, may be classed under one general heading, because they all recommend oily or resinous mixtures to be applied to the stone in a somewhat similar manner.

I have one more invention for a similar purpose to offer to your notice, which has been reserved on account of the indurating mixtures being of an aqueous and more scientific character, and therefore differing essentially from any of the others. The inventor, Mr. Frederick Ransome, has sent me the following particulars: "The process consists in the employment of two or more separate solutions, which, by mutually acting upon each other, produce within the pores of the stone an indestructible mineral precipitate. In operating, the stone may either be immersed in, or saturated on the surface with, a weak solution of silicate of soda or potash; and afterwards with a solution of chloride of calcium or barium, when an insoluble silicate of lime, or baryta, is formed in the pores of the stone, rendering it impervious to moisture and insusceptible of injurious effects from atmospheric influences. Or instead of a silicate of potash or soda, a solution of sulphate of alumina may be employed, and then by an application of baryta, a compound of sulphate of barytes and alumina is produced."

Any of the before named mixtures, whether oily or watery, will readily be absorbed into the pores of a newly worked piece of stone; but after a building has been erected a few years in London, or any other large town, its surface becomes so thoroughly grimed with dust, soot, and impurities of a populous neighbourhood, assisted, in no small degree, by powerful winds and driving rains, that the indurating mixture cannot easily be made to soak in; it will run off the surface of the stone as it would off glass, or other nonabsorbent material. But if, by some contrivance, it can be made gradually to enter within the pores, if the building should have been erected only a few months, the dirt will be so difficult to remove, that a large portion of it must unavoidably be mixed with the indurating materials, and the result will be a dirty, disagreeable appearance, permanently given to the entire edifice. Were it not for the soot and dirt, the oily mixtures applied to lime-stone would be so far blanched in about a year, as to cause the stone to be rather whiter than if no such process had been applied to it. To overcome these objections, some have suggested that the entire surface of the stonework should be scoured, scraped, or even chiselled afresh, in order that the indurating material may have uninterrupted access to the substance of the stone. This proceeding would not only be very expensive, but it would be liable to alter the character and effect of the mouldings, carvings, and decorations generally; and as the projecting parts are usually the first to show symptoms of premature decay, they would therefore require the greatest amount of induration. Unless the indurating fluid can be made to soak into the stone, at least half an inch, it may be worse than useless; because, in all probability, wet will get in behind the hardened surface, and thereby occasion larger portions to exfoilate than if the stone had been left in its natural state.

I may now offer a few comments on the manner of testing the merits of these patented inventions. You have already heard mentioned some extraordinary contrivances of air-tight chambers, and baking and boiling building stones to render them imperishable; such performances, upon samples like those shown to me by the patentees, are quite within the bounds of possibility; but it would be a novelty to see the Parliament Houses first placed in an oven and then in a tank of boiling liquid.

If, therefore, the desired object cannot be effectually accomplished by such means; if the stones cannot be properly protected from the effect of atmospheric influences, without treating them in the manner described, the inference must be, that if a building is merely brushed over a few times with a cold solution, the result will certainly be ineffectual; if the former plan be a sure one, the latter must be very doubtful. Taking all circumstances fairly into consideration, I am of opinion that no plan for indurating and preserving architectural stonework is likely to answer the intended purpose, unless it can be applied after the building is erected, and after the mouldings and carvings are completely finished. Then comes the question, how to know what is the best material, and how is it to be successfully applied. I have seen multitudes of small specimens of indurated stone, which while fresh certainly resist the decomposing influences of air and water; but as the patentees and inventors offer no proofs whatever that the same or such pieces of stone would have rapidly mouldered away, had they not been preserved by their indurating process, how am I to know that the same pieces of stone would not have stood the weather equally well without their application? and I believe, up to this time, no one is prepared to show what condition their specimens will present after eight or ten years' exposure to the weather. I am not disposed to listen with credulity to the opinions or testimonials of individuals, however high their position — however numerous the Roman capital letters may be at the end of their names—unless they have something to relate and to show upon the subject of a more evident and satisfactory character than anything I have heretofore heard or witnessed. No doubt some may consider me captious, over scrupulous, and determined not to believe what I either see or hear; but the *weekly list of Patents*, which are taken out for supposed inventions or improvements, most of which are neither seen nor heard of afterwards, shows how many men there are, who, although they do not always deceive other people, are often very successful in deceiving themselves, by believing they have discovered an invention, of great public utility, which is to "*yield* 200 *per cent. profit*," and which golden prospect their fondest admirers can neither see nor comprehend.

It would be a good plan to try the conservative power of a solution on two or three specimens of stone—Caen, Bath, and Portland for instance—choosing pieces of their respective kinds, well known to be of a perishable quality. I am sorry to say that in London there will be no difficulty in procuring such specimens; each piece to be between two and three feet long, and of sufficient girth to be accurately worked into a few mouldings, such as a piece of cornice, When the working is completed, let each piece be broken (not sawed) in the middle lengthwise, so as to leave clean fractures, with abundant indentations; the two parts will fit each other, without the possibility of either being counterfeited. Let only one piece of each specimen be well prepared with the indurating solution, taking care not to use more or less of the fluid, in proportion to the size of the specimen, than would be used if a large edifice were to be prepared for conservation; then place the prepared and unprepared specimens of each kind of stone side by side, on the top of some elevated building, were they will be fully exposed to all weathers, during several years, more or less according to circumstances. We know beforehand that in course of time the unprepared pieces will show evidence of decay; but if the indurating process answer the intended purpose, if the stones have absorbed the fluid sufficiently deep from their surface to be the means of rendering them durable, the prepared portions ought to be found after a few years unaltered, and comparatively in a perfect state, while their couterparts, having been subjected to precisely the same variations of climate, would perhaps be in an advanced stage of decay, and their architectural features nearly obliterated. Experiments thus performed and recorded would be valuable, because they would prove, as nearly as possible, whether eventually a certain process might be serviceable or useless, or indeed injurious to the stone-work.

During the last twenty or thirty years I have had many conversations with several of the most learned chemists about preserving stone from decay, and have listened with attention to the remarks of intelligent and experienced practical stone-masons, for much gold is sometimes contained in the roughest ore; and a clear operative mechanic, though incapable of expressing clearly that which he conceives in his mind distinctly, will, by judicious questioning, state facts, likely to lead the studious man into a train of ideas which he otherwise might not have thought of. But after all, the object in pursuit seems to be as far off as when I commenced the inquiry; in truth some years ago I thought I knew more of the subject than I do at present; the difficulties appearing to increase as more information is collected. All the methods of induration which are now before the public are merely mechanical mixtures with the stone, a sort of fluid cement or varnish, which surrounds the grains without altering them, although to a certain extent it glues them together, and partially keeps out moisture: but each individual grain continues in the same state, no chemical change whatever has taken place, the elementary constitution of the stone is the same as it was before the indurating material was applied to it. It is a characteristic feature in quarries of oolite that the stone procured from the uppermost beds is generally, perhaps invariably, of a durable quality; whereas the lowest beds are the first to decay, when exposed to weather. The cause of this difference is known to depend chiefly on the quantity and quality of the cementing substance, by which the particles adhere to each other. The cement that unites the globules into a mass is formed of the same elements as the globules themselves, but more crystalline; it is in fact the decomposition of the superincumbent mass, saturating and crystallizing within the beds beneath. But this natural process of indurating is not performed in a day, nor in a year, but in ages; so slow or gradual is the progress, that in scarcely any case is the lowest bed so hard, or so thoroughly saturated with the crystalline material, as those above.

It seems to me, that if we could pursue, or imitate this natural process, it might lead to the best means of improving the natural condition of soft stone; or, in other words, we might finish the stone which is imperfectly formed in the rocks; Nature not having had time to complete her work. Man can command Nature in no other way than by obeying her laws; in all our experiments or performances, it is not we who operate, but the laws of Nature which we set in operation. The durability of compact carbonate of lime, in a crystalline state, either in the form of stalactites, or that of a porous material, rendered dense and durable by impregnation, may be witnessed in numerous instances in this country, especially in the petrifying caverns of Derbyshire. In the South of Italy and in Sicily, the production of excellent building stone, entirely formed by deposition from water, has been going on abundantly, from the earliest ages of the world to the present time. The Temples of Pæstum, constructed more than two thousand years ago, with aqueous deposit from the neighbouring rivers, are still but little decomposed, so far as the stone is concerned. Most of the modern buildings in Rome, including St. Peter's, which are constructed with a similar material, Travertine stone, or Calcareous Tufo, are generally in excellent condition.

In the waters which produce these petrifactions, there must be some solid body as a nucleus to begin upon, but what constitutes it, is in no respect important; any substance will do for the waters to commence their petrifying works upon; hence, at the caverns, "*the wonder seeker*" is invited by the guides, to purchase birds' nests, purses, and various other articles, said to be changed into stone; whereas, in fact, the objects themselves are merely encrusted with stony matter. Although this natural process is progressing now, and has been during all ages, and, to a certain extent, is well understood by chemists and others, yet it has not been applied to any important purposes, and certainly never to artificially indurating and preserving soft stone. If we could successfully imitate nature in this respect, and apply our efforts to the purpose now under consideration, I think they would be more likely to answer than any plan heretofore attempted. It is not in my power to tell you how to proceed, but the principle appears so clear and simple, that I am induced to believe the proper mode of application would soon be found, if scientific men would turn their attention in that direction.

The necessity for preserving the stonework of our buildings from premature decay is entirely an evil of modern date, which, in nearly all cases, ought not to exist; for if builders engage in a legal contract to use the best materials of their respective kinds, they are liable to an action for damage, if it can be proved, that defective stone has been introduced into a building; as such a proceeding must be an imposition, if not a direct fraud, upon those who have to pay for the work. And I believe I am correct in stating, that pleading ignorance of the laws of this country is not considered an excuse for the violation of those laws; and that therefore, in all probability, a verdict would be given against the contractors.

With reference to the proceedings for indurating the stonework of the New Palace at Westminster, I fear the parties in authority are rather premature in their decision. Several experimenters have been set to work without investigation or enquiry; without ascertaining which plan is best, or whether their mode of procedure may or may not be injurious to the stonework, or likely to prevent the success of some other treatment which may hereafter be found superior. With every sentiment of respect for the judgment and general discrimination of the noble and learned Lord, who has lately taken so much interest in this matter; I trust he will forgive me, if I entertain the idea, that his lordship has yet much to learn, before he can properly adjudicate and decide on matters relating to the decay and preservation of stonework at the Parliament Houses.

If there ever was a time, when a knowledge of good and bad stone was of considerable importance to the British Public, that time is now arrived. Our Government is contemplating the covering of more than twenty acres of ground, at Westminster, with official buildings of a palatial character; it is therefore to be hoped that the subject of our attention this evening will apply only to the times past and present, and that in future, when a magnificent structure shall be completed, the external masonry may remain unimpaired during the lives of those who were at the cost of erecting it, without the expense and annoyance of scaffolding, saturating, discolouring, and many other vexatious incidents attendant on the endeavour to make the best of a discreditable affair.

The Chairman, Mr. Ashpitel, Fellow, said he believed that, as architects, they might consider it their own fault that stone-work so often failed, as it was conceded that England had as good stone as any country in the world. Perhaps the first cause of failure was the want of sufficient care in selecting stone. He had noticed the care taken in this matter in the restoration of Southwell Minster: it was well known that there were in all quarries both good and bad beds of stone, and the selection should be made in the quarry itself. The durabillty of St. Paul's Cathedral might be ascribed to the precaution taken by Sir Christopher Wren, who, as soon as the stone was quarried, had it exposed upon the sea-shore for three years before it was used. This could hardly be termed seasoning, as stone was a very different kind of material from wood; but the effect was that, after exposure to the weather, the perfect blocks were easily distinguished from the defective ones, and only those which had stood the weather well were worked. He had been told that Sir Robert Smirke took a somewhat similar precaution at the new Post Office. Unfortunately few masons or clerks of works understood the bed of the stone; as in addition to the oolitic construction of some stones, pointed out by Mr. Smith, every kind of stone in England, excepting Portland, had the further characteristic of a visible cleavage or bed, and if placed in a building on its wrong bed, the stone would not stand. This was the principal cause of the failure of many buildings of Bath and Caen stone. Granite when improperly bedded, failed from the decomposition of the feldspar; and in some parts of Waterloo Bridge the stones appeared as if gnawed into by the weather. From some experiments made by Mr. Freeman, it appeared that in Portland stone there was not any visible bed or cleavage. The workmen were commonly in the habit of turning about the blocks of Caen stone in order to find the bed,—the softest side being the under-bed. He quite agreed with Mr. Smith that alkalies would not injure stone, but they all knew that acids did to a great degree, and consequently the sulphurous acid in the London atmosphere had a corroding effect upon stone-work. Mr. Smith had not referred to the method of preserving the monuments in Westminster Abbey, adopted by Mr. Gilbert Scott, the architect to the fabric. Some of these were of Purbeck marble, and in a sad state of disintegration. Mr. Scott was so careful of these monuments that he would hardly suffer a brush to touch them; but in order to keep the body of the stone together, he directed a solution to be made of the most colourless lac and spirits of wine, and the dust having been blown from the surface of the stone with a large pair of bellows, the mixture was applied by means of a garden syringe with a fine rose. How long this method would prove effectual he could not say, but as it was very cheap, and did no injury whatever, it was worthy of attention.

MR. BURNELL, Associate, read a communication from M. Viollet-le-Duc, describing the process of silicatization adopted by him at Notre Dame, Paris. Mr. BURNELL added that he had been over the works at Notre Dame, where M. Viollet-le-Duc pointed out to him the experiments he had made. He had himself tried the process at St. Luke's, Chelsea, where the stone had become very hard indeed. He had also broken up and powdered some Farley Down Bath stone, and mixed it with the silicate of potash, and when that was absorbed, he silicated the mass again. This was two years ago, and recently he boiled a portion of the composition in water for an hour, and could not discover that it discharged any salt. He again boiled it in a solution of potash, and could not discover that the mass was altered, or that there was any free silica; thus proving, as he thought, that the silicate of lime was formed. He agreed with M. Viollet-le-Duc that the success of the process depended upon the stone upon which it was tried: the great mistake in the experiments which had been made at the House of Lords, two years ago, was that they took place in the month of November, when the stone was so damp that it could imbibe nothing, and consequently the experiments could not succeed. Mr. Smith's impression was that one application of the process was sufficient, but on the contrary it was essential that it should be done day after day; that the superfluous salt should be all washed out, and a sufficient quantity of silica introduced to form with the lime an insoluble material—the silicate of lime.

MR. BRANDON, Fellow, suggested that the subject was sufficiently interesting and important for an entire evening's discussion, and that it was therefore desirable to adjourn it to a future meeting.

MR. M. D. WYATT, Hon. Sec., thought that, as many gentlemen would be desirous to take part in it, it would be desirable that any communication respecting the various processes, and their cost, which might be sent to the Council, should be digested into as short a compass as possible, and that the Council should exercise their discretion in reducing the length of such communications.

The evening on which the discussion should be resumed having been left to the decision of the Council, the Meeting adjourned.

ON THE LEADING PRINCIPLES IN THE COMPOSITION OF ORNAMENT OF EVERY PERIOD, FROM THE GRAMMAR OF ORNAMENT.

By Owen Jones, Fellow.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, Dec. 15th, 1856.

Ornament is the result of an innate desire in man to produce for himself forms of beauty, in imitation of the works of nature by which he is surrounded: he sees everywhere that the Creator has made all things not only useful, but beautiful, and he in turn desires to create.

There is scarcely a people, in however early a state of civilisation, with whom this strong desire does not exist. It is absent in none, and it grows and increases in the ratio of their progress in civilisation.

It is to this feeling that we must ascribe the tattooing of the human face and body, resorted to by the savage to increase the expression by which he seeks to strike terror on his enemies or rivals, or to create what appears to him a new beauty. As we advance higher through the whole range of civilisation, from the decoration of the rude tent or wigwam to the sublime works of a Phidias or a Praxiteles, the same feeling is everywhere apparent. Man's highest ambition is to create, to stamp on this earth the impress of an individual mind.

From time to time a mind, stronger than those around it, will impress itself on a generation, and carry with it a host of others following in the same direction; yet never so completely as to destroy the individual ambition to create. Hence the formation of styles, and the modification of styles.

Ornament, with every people, precedes the development of every other form of Art. Architecture, one of the earliest, adopts ornament, does not create it. As we find that to ornament is, with every people, one of the first natural instincts; so we shall find, that in the exercise of this instinct they could not do otherwise than follow natural laws.

The ornament of a savage, being the result of a natural instinct, is necessarily always true to its purpose; whilst in much of the ornament of civilised nations, the first impulse which generated certain received forms being enfeebled by constant repetition, the ornament is oftentimes misapplied. And instead of first making the most convenient form, and adding beauty, all beauty is destroyed, because all fitness, by superadding ornament to ill-contrived form. If we would return to a more healthy condition, we must even be as little children, or as savages: we must get rid of the acquired and artificial, and return to and develope our natural instincts.

It would be far beyond the limits of the powers of any one individual to attempt to gather together illustrations of the innumerable and ever-varying phases of Ornamental Art. It would be barely possible if undertaken by a government, and even then it would be too voluminous to be generally useful. All, therefore, that I have proposed to myself in forming the collection which I have ventured to call the *Grammar of Ornament*, has been to select a few of the most prominent types in certain styles closely connected with each other, and in which certain general laws appeared to reign independently of the individual peculiarities of each. And it will be my endeavour to show, that in all the varying phases of Ornamental Art these leading principles are the same as those which every work of nature displays.

I have ventured to hope that, in bringing into immediate juxtaposition many forms of beauty which every style of ornament presents, I might aid in arresting that unfortunate tendency of our time to be content with copying, whilst the fashion lasts, the forms peculiar to any bygone age, without an endeavour to ascertain, generally completely ignoring, the peculiar circumstances which rendered an ornament beautiful, because it was appropriate, and which, as expressive of other wants, when thus transplanted, as entirely fails.

It is more than probable that the first result of sending forth to the world this collection will be seriously to increase this dangerous tendency, and that many will be content to borrow from the past those forms of beauty which have not already been used up *ad nauseam*. It will be my endeavour to arrest this tendency, and to awaken a higher ambition.

By endeavouring to search out the thoughts which have been expressed in so many different languages, we may hope to find an ever-gushing fountain in place of a half-filled stagnant reservoir.

In the prosecution of this work, and in the study of ornament, I have gathered these main facts:—

First. That whenever any style of ornament commands universal admiration, it will always be found to be in accordance with the laws which regulate the distributions of form in nature.

Secondly. That however varied the manifestations in accordance with these laws, the leading ideas on which they are based are very few.

Thirdly. That the modifications and developments which have taken place from one style to another have been caused by a sudden throwing off of some fixed trammel, which set thought free for a time, till the new idea, like the old, became again fixed, to give birth in its turn to fresh inventions; changes in the general character of ornament which are analogous in their results to organic changes in architecture, such as the substitution of the arch for the horizontal beam by the Romans, and the pointed arch of the Normans for the round arch of their predecessors. They have the same influence in the history of Art as the sudden discovery of a general law in science, or the lucky patented idea which, in any work of industry, suddenly lets loose thousands of minds to examine and improve upon the first crude thought.

Lastly. I will endeavour to show that the future progress of ornamental art may be best secured by engrafting on the experience of the past the knowledge we may obtain by a return to nature for fresh inspiration. To attempt to build up theories of art, or the formation of a style, independently of the past, would be an act of extreme folly. It would be at once to reject the experience and the accumulated knowledge of thousands of years. On the contrary, we should regard as our inheritance all the successful labours of the past, not blindly to follow them, but simply as guides by which we may find the true path.

We have, then, first to consider what are the laws of form which we find in nature, and which are universally obeyed in all those archaic periods of art of which the works command, and ever will command, the admiration of the world.

If we examine any work of nature—a man, an animal, a tree, a flower,—we shall at once see that, independently of the beauty which results from the fitness of any part for the duty it has to perform, there is another beauty superadded which bears the same relation to the general structure that ornament does to the architectural members of which it forms a part. It is, in fact, ornament. There is no necessity for the covering of the muscles or the bark of a tree to assume the beautiful form which nature has given to it, still less for the decorative beauty superadded, both of surface, ornament, and of colour, except to satisfy certain faculties which the Creator has implanted in us. Man, besides his intellect, possesses sentiments and affections, and the delight we experience in looking upon any work of perfect beauty results from all these faculties being thoroughly satisfied, leaving the mind in a state of repose. We therefore lay it down as an axiom.—

1. That true Beauty results from that repose which the mind feels when the eye, the intellect, and the affections, are satisfied from the absence of any want. This test may be applied to ornament in many ways.

Egyptian ornament was not only constructed in a way to satisfy the eye by the beauty of its form, the mind by the propriety of its application, but also as a religious symbol it appealed to the sentiments and affections. It was complete in itself, and the mind of the beholder was in as perfect rest as when looking on its natural type. Egyptian constructive ornament was always symbolic: the column only a few feet high, or one forty or sixty feet, as at Luxor or Karnac, was an enlarged papyrus plant; the base representing the root, the shaft the stalk, and the capital the full-blown flower, surrounded by a bouquet of smaller plants, tied together by bands. Not only did a series of columns represent a grove of papyri, but each column was in itself a grove; and we find on the walls of Egyptian buildings representations of groves of papyri in various stages of growth, which would only have to be assembled as they stand, and tied round with a string, and we should have the Egyptian shaft, with its highly ornamental capital. Egyptian art, although the oldest, is, in all that is requisite to constitute a true style of art, the most perfect. The language in which it reveals itself to us may seem formal and rigid, but the ideas and the teachings it conveys to us are of the soundest. All other styles approach perfection only so far as they follow, in common with the Egyptians, the true principles to be observed in every flower that grows. Like these favourites of Nature, every ornament should have its perfume,—*i.e.* the reason of its application. It should endeavour to rival the grace of construction, the harmony of its varied forms, and the due proportion and subordination of one part to the other found in the model. When we find any of these characteristics are wanting in a work of ornament we may be sure that it belongs to a borrowed style, where the spirit which animated the original work has been lost in the copy.

Greek ornament, not being a symbol possessing only beauty of form and fitness of application, leaves a want, which is only supplied when the ornament is used as an accessory to painting and sculpture. The Moors and Arabs, on the contrary, being debarred from these adjuncts, but possessing the same refined instincts as the Egyptians, by interweaving with their ornaments inscriptions appealing both to the highest faculties and sentiments, obtained that same repose which we find in every work of nature, however humble, and which we hold to be the first condition of a work of art.

2. Again we never find in nature any superfluous ornament: there we always find construction decorated, decoration never purposely constructed. When an ornament is constructed falsely, appearing to give support which it does not, it fails to engender the feeling of repose by neglecting to satisfy the intellect, however much its beauty and other charms may appeal to the eye and the affections. This law, so constantly violated in modern times, was universally obeyed in all the best periods of Art. The Egyptians and the Greeks always obeyed it; as did likewise the Arabs, Moors, Indians, and even the Chinese. With the Moors especially,—not only does all their ornament obey this law of decorating construction, but the constructive idea is carried out in the details of the ornament itself. The Romans, the artists of the Renaissance, the Italian, and the later Gothic periods, equally disregarded it. We derive farther, from observation of Nature's works, another proposition, viz. that—

3. Beauty of form is produced by lines growing out one from the other in gradual undulations; there are no excrescences, nothing could be removed and leave the form equally good or better.

There is nothing more characteristic of true art than the gradual undulation of form. In nature all transitions of curved lines from curved, or of curved lines from straight, are gradual. There is nothing abrupt, and this is the feature which distinguishes in all things, the elegant and refined from the coarse and vulgar; it is the property of pure form, either in rest or in motion.

The gradual undulation of form is the secret of success in Greek art; the want of it is the sign of the decline of the Roman. It was possessed by the Gothic artists of the thirteenth century, and even by those of the Renaissance, but it lasted with them only for a time.

With Michael Angelo and his followers commenced a new era. Grace of outline and delicacy of undulation were abandoned for boldness of conception and wonderful fertility of execution, which, whilst appealing more strikingly to the intellect and the senses, left unsatisfied the more refined instincts and the affections. The same change took place in ornament; from the delicate relief and modulation of the Renaissance artists, those of the sixteenth and seventeenth centuries returned to the coarser modelling of the Romans. The refinements which the early artists obtained by a return to nature for fresh inspiration were gradually forgotten, and ended in a style which for want of a name has been called the Rococo. In modern times a return to a more moderate relief was obtained in this country by the works of Adams, Flaxman, and Sir John Soane; but it took but slight root, and the great rush upon Roman architecture in the time of George the Fourth, deluged the country with ornament outrivalling in coarseness all Roman models, and ended in a state of disorder, in the misapplication and imperfect modelling and drawing of ornament, from which we are now but slowly recovering. The artists of France have been kept within bounds. Percier and Fontaine exercised a similar influence in France to our Adams here—an influence, which from the more general academic system in France, has not been lost sight of; and the abundant studies of so many French artists in Italy have resulted in forming in France a style of ornament which borders on the other extreme, and from its flatness often verges upon insipidity.

If we examine the leaf of a plant or a tree, we shall find that, independently of the beauty of the general form, there is another beauty which arises from the exquisite way in which all the lines on the surface are distributed over its area.

However varied the general outline of the leaf, it will be found to be arranged in masses, the areas of which always diminish in regular proportion. Up the centre of each mass is a main sap-feeder; and as the object clearly is to distribute the sap to the extremities of the leaf in the readiest way, however varied the form, the main sap-feeders will divide the masses into proportionate areas. Every portion of these spaces is again subdivided in the same way; with such perfection, that the skeleton of a dissected leaf presents the appearance of a series of graduated tints in which there is no break.

Now we shall find in all decorative ornament of the best period that this natural law has been instinctively obeyed, not only in the distribution of form on the individual ornament, but also in the general arrangement of a group, and we therefore venture to lay down as an axiom that, in the composition of ornament,—

4. THE GENERAL FORMS SHOULD BE FIRST CARED FOR; THESE SHOULD BE SUBDIVIDED AND ORNAMENTED BY GENERAL LINES; THE INTERSTICES MAY THEN BE FILLED IN WITH ORNAMENT, WHICH MAY AGAIN BE SUBDIVIDED AND ENRICHED FOR CLOSER INSPECTION.

The Greeks were most happy in their recognition of this law; but the Moors, perhaps, have more fully carried it out. With them ornament adapts itself so perfectly to the general form which encloses it, that it as often would appear to have suggested, as to have resulted from it.

5. We observe also another natural law in the works of all the Oriental nations, that in their surface decoration ALL LINES FLOW OUT OF A PARENT STEM; EVERY ORNAMENT, HOWEVER DISTANT, CAN ALWAYS BE TRACED TO ITS BRANCH AND ROOTS.

6. ALL JUNCTIONS OF CURVED LINES WITH CURVED, OR OF CURVED LINES WITH STRAIGHT, SHOULD BE TANGENTIAL TO EACH OTHER.

Nature is said to abhor a vacuum; it may equally be said she abhors an angle. In the whole range of her vegetable productions it will be impossible to find a line butting on another line, every branch of a tree, every stem of a leaf, every vein upon the leaf, is always softened at the point of junction with another by a re-entering curve. This also is a natural law universally obeyed in the best periods of art, equally violated when art declines. It is always present in Greek ornament, often absent in the ornament of Pompeii.

Another universal law which may be recognised in every work of nature, and which should be observed in every assemblage of forms, as well as in each simple ornament, is, that whenever we recognise perfect harmony in any composition, it will be found that the straight, the inclined, and the curved, are properly balanced and contrasted. When any of these forms are wanting, the eye is as much disturbed by an unsatisfied want as when, looking on any composition of colours, any one of the three primaries is absent. In all the geometrical patterns of the Egyptians and all the Mohammedan races this is especially cared for, as well as by the Greek and by the Gothic architects in all their structures. It is daily and hourly neglected in modern times. It is one of the most serious faults in the decoratioos of the interiors of houses, and absolutely fatal in articles of costume, where lines are constantly running in one direction uncorrected, and as constantly tending to destroy the repose of the forms which they are designed to decorate and develope.

We have thus seen that the natural laws of decorating construction, the gradual undulations of form, proportionate division and subdivision of general masses; the radiation from a parent stem, tangential curvature of lines; the balancing and contrast of the straight, the inclined, and the curved, are universally obeyed in every perfect work of ornament.

I will now endeavour to show, in the second place, that HOWEVER VARIED THE FORMS WHICH HAVE BEEN GENERATED IN THE SEVERAL STYLES OF ORNAMENT IN ACCORDANCE WITH THESE GENERAL LAWS, THE LEADING IDEAS ON WHICH THEY ARE BASED ARE VERY FEW.

The ornament of Egypt is founded on few types, and these natural types. The lotus and papyrus, growing on the banks of the Nile, symbolising the food for the body and mind; the feathers of rare birds, which were carried before the king as emblems of sovereignty; the palm branch, with the twisted cord made from its stems; these are the few types which form the basis of that immense variety of ornament with which the Egyptians decorated the temples of their gods, the palaces of their kings, the coverings of their persons, their articles of luxury, or of more modest daily use, from the wooden spoon which fed them, to the boat which carried their similarly adorned embalmed bodies across the Nile to their last home in the valley of the dead.

In Greek ornament the types are still more limited; the honeysuckle and the acanthus are as universal as the lotus and papyrus with the Egyptians. There is much, however, of Greek ornament which is rather constructed on the general principles which reign in all plants, than representing any particular plant. The laurel, ivy, and vine are sometimes used as borders on vases surrounding pictures, and may be said to be in such cases symbolical; but as a general rule they were not so, and must be considered simply decorative features, which would have afforded but little satisfaction in themselves when deprived of the pictures to which they were the adjuncts.

The Romans, through the Greeks, adopted the acanthus almost exclusively. Their carved ornaments are always modifications of the acanthus; in the painted decorations the acanthus forms the groundwork on which are engrafted representations of natural plants and flowers.

There is no form which has taken such deep root as this acanthus leaf, and this we think because it contains within itself all the true principles of ornamentation. The Romans, however, were limited in the use of it by the fixed law that each acanthus leaf grew out of another; but when this law was abandoned in the Byzantine period, it led to the formation of continuous scroll-work, which is so common in the MSS. of the twelfth and thirteenth centuries. The artists of the Renaissance, in returning to the acanthus, returned also to this law of its use; and, like the Roman, all their ornaments grew one out of the other.

In the ornament of the thirteenth century, again, there are but few typical forms. The most endless variety of combinations of foliage is produced by a repetition of trefoil and cinquefoil leaves, which have scarcely any particular relation to any natural plant, but being constructed on true principles are necessarily beautiful. In the later Gothic period, as a much greater approach to Nature was attempted, a greater variety of types were used; but the ideal representation formed on a recognition of a natural principle was far beyond, in effect, the result obtained by the imperfect attempt at the natural. In violating consistency in the application, all true beauty was lost.

In the purely conventional ornament of the Oriental nations, it is still more remarkable how few are the generating forms.

The secret of success in every work of ornament is the production of a broad general effect by the repetition of a few simple elements; variety should rather be sought in the arrangement of the several portions of a design than in the multiplicity of varied forms.

I have now to call your attention to some of these sudden changes in each style which have been the cause of so much development in architectural forms.

The religious laws of the Egyptians forbade any change in their generally received forms, and there is the most remarkable unity of style over a period of probably many thousand years. This, however, did not necessarily result in uniformity; and although the lotus and papyrus always formed the types of the capitals of their columns, there was the greatest variety in the arrangements of these types. In the Pharaonic period, however, they were generally confined in the capitals of columns of large diameter to the bell-shape, on which were inscribed the representations of the lotus and papyrus; and in the smaller columns to the bundle of buds tied together and surmounted by a square abacus. During the Greek period, however, this was suddenly departed from, and the idea arose of breaking up the circular form of the capital; the same forms which had before been carved from the surface were here moulded on it; and beginning with the circular form, they surrounded it with four, eight, and then sixteen other circles. This principle once admitted, it will be seen how readily the general form could be varied. As an opposite example to this may be noticed the Corinthian capital, which to our own time has never varied, because no modification in plan has ever been attempted. It is always an acanthus leaf arranged round a bell-shaped vase; and the only difference ever found between one capital and another, results from the more or less perfection of the modelling of the leaves, or in the graceful, or otherwise, proportions of the bell. Let the same modification in plan be attempted with the Corinthian capital, and it could not fail to produce an entirely new order of forms, whilst still retaining, if such should be desirable, the idea of the acanthus leaf applied to the surface of a bell-shaped vase.

The development of Roman ornament again was restrained by the fixed law, that each acanthus leaf grew out of the other with a leaf folded back at the point of junction. During the Byzantine period this was gradually abandoned; and when once free from this, a most rapid development in flowing lines took place in the styles which succeeded, till we arrive at that freedom in ornament which is found in the architecture throughout the world during the thirteenth century. Though other causes have been assigned to it, I myself believe that the Ionic capital of the Greeks is only an application of the volute form, which results from the common rope ornament of the Egpytians. The unwinding of a coil of rope would give the first idea to any people of the volute form, as the twisting of two strands of a rope would give the first idea of the spiral line. The volute of the Ionic capital is produced by repeating in opposite directions the very form which is the ground-work from which all Greek ornament springs. The egg-and-tongue moulding of the Greeks is clearly suggested by the cornices so common in Egypt formed by the pendent lotus. The conventional honeysuckle of the Greeks led in subsequent styles to the formation of ornaments similarly constructed, yet widely differing in general appearance.

But one of the most remarkable series of developments, and which are most easily traced, are those ornaments which result from the intersection of equidistant lines called frets. They are common to every people, and arise so naturally from their very first attempt at ornament, that it is not necessary that they should have been borrowed from each other: but there is such a remarkable series from the Egyptian to the Moresque, that it can hardly be doubted that they have been so. The Greek fret differs only from the Egyptian, in that the jumps are generally uniform, and they are the truest. So long as the idea remained fixed that they were formed by horizontal lines intersecting perpendicular lines, no great development could take place. When we have the simple meander, or one with a second line interlacing with the first, or a fret one under the other, or running in different directions, or back to back, or running round a square, we have exhausted all the combinations of which it is susceptible; but the instant we abandon the law of perpendicular lines intersecting horizontal lines, a rapid development takes place; the raking fret at once suggests to the Arabs to send diagonal lines in the opposite direction crossing the first. From this spring instantaneously the Moresque interlacing patterns; not content with this, the Moors saw that they could use the horizontal perpendicular, and diagonal lines in two ways, and they have therefore two varieties which produce patterns totally distinct in effect, though the same in principle; in the first, the divisions are equidistant diagonally, crossed by horizontal and perpendicular lines on each square; and on the other, the perpendicular and horizontal lines are equidistant, and the diagonal lines cross each alternate square. The number of patterns that can be produced by this system may be said to be infinite. The knotted work of the Celts differs from this system only in adding curved terminations to the diagonal lines, and may have either been developed in the same way or from the rope ornaments of the Greeks, which were also so common on Roman pavements.

The History of Architecture, as it is written in the monuments, is full of these changes. Architecture never rests; it either goes forward or backward, and runs, as it were, in a series of waves; when the highest point is reached, this is as a knife-edge: it cannot rest upon it, but descends to rise again under fresh impulse.

At present we are, as it were, in a troubled sea, on which the waves have been so tossed about, that they have lost all form; the impulse having gradually got weaker and weaker, we are gradually approaching a dead calm.

In any attempt at progress in art, European nations are under great disadvantages from the general want of unity which exists. In all ages but the present, architecture has been the expression of the religious feelings of the time; but since the Reformation separated the tie between religion and art, the world has become as Protestant in art as Protestant in faith. The artistic mind has indulged in the same liberty of selection for its worship of the beautiful, as is allowed to each human soul in its worship of the Creator.

If, therefore, we would seek for vitality in art, we must turn our attention to the nations who are still faithful to the creed which inspired their art.

This was clearly seen in the Exhibition of the Works of Industry of all Nations, in 1851, which was barely opened to the public ere attention was directed to the gorgeous contributions of India.

Amid the general disorder everywhere apparent in the application of art to manufactures, the presence of so much unity of design, so much skill and judgment in its application, with so much of elegance and refinement in the execution, as was observable in all the works, not only of India, but of all the other Mohammedan contributing countries,—Tunis, Egypt, and Turkey,—excited a degree of attention from artists, manufacturers, and the public, which has not been without its fruits.

Whilst in the works contributed by the various nations of Europe, there was everywhere to be observed an entire absence of any common principle in the application of art to manufactures,—whilst from one end to the other of the vast structure there could be found but a fruitless struggle after novelty, irrespective of fitness, that all design was based upon a sytem of copying and misapplying the received forms of beauty of every bygone style of art, without one single attempt to produce an art in harmony with our present wants and means of production—the carver in stone, the worker in metal, the weaver and the painter, borrowing from each other, and alternately misapplying the forms peculiarly appropriate to each—there were to be found in isolated collections at the four corners of the transepts all the principles, all the unity, all the truth, for which we had looked elsewhere in vain, and this because we were amongst a people practising an art which had grown up with their civilisation, and strengthened with their growth. United by a common faith, their art had necessarily a common expression, this expression varying in each according to the influence to which each nation was subject. The Tunisians still retaining the art of the Moors, who created the Alhambra; the Turks exhibiting the same art, but modified by the character of the mixed population over which they rule; the Indians uniting the severe forms of Arabian art with the graces of Persian refinement.

Deprived, then, as we are of the advantage of a common faith to inspire a common expression in art, does it necessarily follow that we have no hope of progress? Although we cannot have common ground of thought, is there any reason why we should not think rightly? is there no escape from the disorder which was so apparent in 1851? I think there is, and I firmly believe that it will be found as easy to originate as to copy, if we can only throw off the lethargy which hangs over us, and that discouragement which makes us consider the works of the past as final instead of relative truth. In this very matter, indeed, opinion changes so rapidly, that there is reason to believe that as each style usurps the place of honour only for a time, and then rapidly runs its course, the time will arrive when all shall have had a fair trial; we must then, in very despair of finding novelty, be led to look forward instead of backward.

Let us then, once for all, admit that each style of art which has appeared has worthily filled its appointed purpose. That no one has more claim to our attention than another, except so far as it follows general laws, which laws will be as true in the future as they have been in the past, and will, therefore, be our safest guides in an onward path.

Let us, then, accept the experience of the past as our inheritance, not rashly to squander it, but rather that we may add to the store.

I have attempted to show that, in all the best periods of art, all ornament was rather based upon an observation of the principles which regulate the arrangements of form in nature, than on an attempt to imitate the absolute forms of those works; and that whenever this limit was exceeded in any art, it was one of the strongest symptoms of decline: true art consisting in idealizing, and not copying the forms of nature.

I think it desirable to insist rather strongly on this point, as in the present uncertain state in which we are, there seems a general disposition arising to reproduce, as faithfully as may be possible, natural forms as works of ornament; the world has become weary of the eternal repetition of the same conventional forms which have been borrowed from styles which have passed away, and therefore can excite in us but little sympathy. There has arisen, we say, a universal cry of "Go back to nature, as the ancients did." I should be amongst the first to echo that cry, but it will depend much on what we go to seek, how far we may succeed; if we go to nature as the Egyptians and the Greeks went, we may hope; but if we go there like the Chinese, or even as the Gothic artists of the fourteenth and fifteenth centuries, we should gain but little. We have already, in the floral carpets, floral papers, and floral carvings of the present day, sufficient evidence to show that no art can be produced by such means; and that the more closely that nature is copied, the farther we are removed from producing a work of art.

The pleasure we derive in contemplating the rude attempts at ornament of the most savage tribes, arises from our appreciation of a difficulty accomplished; we are at once charmed by the evidence of the intention, and surprised at the simple and ingenious process by which the result is obtained. In fact, what we seek in every art is the evidence of mind—the evidence of creative power—which all feeling as a natural desire within them, are satisfied when they find it developed in others. It is strange, but so it is, that this evidence of mind will be more readily found in the rude attempts of ornament of a savage tribe than in the innumerable productions of a highly-advanced civilization. Individuality decreases in the ratio of the power of production. When art is manufactured by combined effort, not originated by individual effort, we fail to recognize those true instincts which constitute its greatest charm.

Although ornament is most properly only an accessory to architecture, and should never be allowed to usurp the place of structural features, or to overload or to disguise them, it is in all cases the very soul of an architectural monument.

By the ornament of a building, we can judge more truly of the creative power which the artist has brought to bear upon the work. The general proportions of the building may be good, the mouldings may be more or less accurately copied from the most approved models, but the very instant that ornament is attempted, we see how far the architect is at the same time the artist. It is the best measure of the care and refinement bestowed upon the work. To put ornament in the right place, is not easy; to render that ornament at the same time a superadded beauty and an expression of the intention of the whole work, is still more difficult.

Unfortunately, it has been too much the practice in our time to abandon to hands most unfitted for the task the adornment of the structural features of buildings, and more especially their interior decorations.

The fatal facility of manufacturing ornament, which the revived use of the acanthus leaf has given, has tended very much to this result, and deadened the creative instinct in artists' minds. What could so readily be done by another, they have left to that other to do, and so far have abdicated their high position of the architect, the head and chief.

How, then, is this universal desire for progress to be satisfied—how is any new style of ornament to be invented or developed? Some will probably say, a new style of architecture must first be found, and that we should be beginning at the wrong end to commence with ornament.

I do not think so. I have shown that the desire for works of ornament is co-existent with the earliest attempts of civilisation of every people; and that architecture adopts ornament, does not create it.

The Corinthian order of architecture is said to have been suggested by an acanthus leaf found growing round an earthern pot; but the acanthus leaf existed as an ornament long before, or, at all events, the principle of its growth was observed in the conventional ornaments of the Greeks. It was the peculiar application of this leaf to the formation of the capital of a column which was the sudden invention which created the Corinthian order.

The principle of the foliation, and even the general form of the leaves which predominate in the architecture of the thirteenth century, existed long before in the illuminated MSS.; and, derived as they were, most probably, from the East, have given an almost eastern character to early English ornament. The architects of the thirteenth century were therefore very familiar with this system of ornamentation; and we cannot doubt, that one cause of the adoption so universally of this style during the thirteenth century, arose from this great familiarity with its leading forms which already existed.

The floral style, in direct imitation of nature which succeeded, was also preceded by the same style in works of ornament; and the facility of painting flowers, in direct imitation of nature in the pages of a missal, induced an attempt to rival them in stone, in the buildings of the time.

The architectural ornament of the Elizabethan period is mostly a reproduction of the works of the loom, the painter, and the engraver. In any borrowed style, more especially, this would be so. The artists of the Elizabethan period were necessarily much more familiar with the paintings, hangings, furniture, metal-work, and other articles of luxury, which England received from the continent, than they would be with the architectural monuments; and it is this familiarity with the ornamentation of the period, but imperfect knowledge of the architecture, which led to the development of those peculiarities which distinguish Elizabethan architecture from the purer architecture of the Revival.

I therefore think I am justified in the belief, that a new style of ornament may be produced independent of a new style of architecture; and, moreover, that it would be one of the readiest means of arriving at a new style: for instance, if we could only arrive at the invention of a new termination to a means of support, one of the most difficult points would be accomplished.

The chief features of a building which form a style, are, first, the means of support; secondly, the means of spanning space between the supports; and, thirdly, the formation of the roof. It is the decoration of these structural features which give the characteristics of style, and they all follow so naturally one from the other, that the invention of one will command the rest.

It would appear, at first sight, that the means of varying these structural features had been exhausted, and that we have nothing left but to use either one or the other of the systems which have already run their course.

If we reject the use of the column and horizontal beam of the Greeks and Egyptians, the round arch of the Romans, the pointed arch and vault of the Middle Ages, and the domes of the Mohammedans, it will be asked, What is left? We shall perhaps be told that all the means of covering space have already been exhausted, and that it were vain to look for other forms. But could not this have been said in all time? Could the Egyptian have imagined that any other mode of spanning space would ever be found than by his huge blocks of stone? Could the Mediæval architect have ever dreamed that his airy vaults could be surpassed, and that gulfs could be crossed by hollow tubes of iron? Let us not despair; the world has not seen, most assuredly, the last of the architectural systems. If we are now passing through an age of copying, and architecture with us exhibits a want of vitality, the world has passed through similar periods before. From the present chaos there will arise, undoubtedly (it may not be in our time), an architecture which shall be worthy of the high advance which man has made in every other direction towards the possession of the tree of knowledge.

To return to our subject, how is any new style of art or new style of ornament to be formed, or even attempted to be formed? In the first place, we have little hope that we are ever destined to see more than the commencement of a change; the architectural profession is at the present time too much under the influence of past education, on the one hand, and too much influenced by an ill-informed public on the other; but the rising generation in both classes are born under happier influences, and it is to them we must look for hope in the future. It is for their use that I have gathered together this collection of the works of the past; not that they should be slavishly copied, but that artists should, by an attentive examination of the principles which pervade all the works of the past, and which have excited universal admiration, be led to the creation of new forms equally beautiful. We believe that if a student in the arts, earnest in his search after knowledge, will only lay aside all temptation to indolence, will examine for himself the works of the past, compare them with the works of nature, bend his mind to a thorough appreciation of the principles which reign in each, he cannot fail to be himself a creator, and to individualize new forms, instead of reproducing the forms of the past. We think it impossible, if a student be fully impressed with the laws of the universal fitness of things in nature, with the wonderful varieties of form, yet all arranged around some few fixed laws, the proportionate distribution of areas, the tangential curvatures of lines, and the radiation from a parent stem, whatever type he may borrow from nature, if he will dismiss from his mind the desire to imitate it, and will only seek to follow still the path which it so plainly shows him——we think it impossible but that new forms of beauty will more readily arise under his hand, than can ever follow from a continuation in the prevailing fashion of resting only on the works of the past for present inspiration. It will require but a few minds to give the first impulse: the way once pointed out, others will follow, readily improving, refining upon each other's efforts, till another culminating point of art shall be again reached, to subside into decline and disorder. For the present, however, we are far enough removed from either stage.

I have been desirous to aid this movement to the extent of my power; and in the ten plates of natural leaves and flowers which accompany the examples of ancient ornament, I have gathered together many of those natural types which I thought best calculated to awaken a recognition of the natural laws which prevail in the distribution of form. But, indeed, these laws will be found to be so universal, that they are as well seen in one leaf as in a thousand. The single example of the chestnut leaf contains the whole of the laws which are to be found in nature; no art can rival the perfect grace of its form, the perfect proportional distribution of the areas, the radiation from the parent stem, the tangential curvatures of the lines, or the even distribution of the surface decoration. We may gather this from a single leaf; but if we further study the law of their growth, we shall see in an assemblage of leaves of the vine or the ivy, that the same law which prevails in the formation of the single leaf prevails also in the assemblage of leaves. As in the chestnut leaf, the area of each lobe diminishes in equal proportion as it approaches the stem; so in any combination of leaves, each leaf is everywhere in harmony with the group: as in one leaf the areas are so perfectly distributed, that the repose of the eye is maintained, it is equally so in the group; we never find a disproportionate leaf interfering to destroy the repose of the group. This universal law of equilibrium is everywhere apparent in every work of nature. The same laws prevail in the distribution of lines on the surface of flowers; not a line upon the surfaces but tends more surely to develope the form—not a line which could be removed, and leave the form more perfect; and this why? Because the beauty arises naturally from the law of the growth of each plant. The life-blood—the sap, as it leaves the stem—takes the readiest way of reaching the confines of the surface, however varied that surface may be; the greater the distance it has to travel, or the weight it has to support, the thicker will be its substance.

From the same cause it results, that the basis of all form in natural flowers is geometry; the impulse which forms the surface, starting from the centre with equal force, necessarily stops at equal distances: the result is symmetry and regularity.

Who, then, will dare say that there is nothing left for us but to copy the five or seven-lobed flowers of the thirteenth century; the Honeysuckle of the Greeks or the Acanthus of the Romans,—that this alone can produce art? Is Nature so tied? See how various the forms, and how unvarying the principles. We feel persuaded that there is yet a future open to us; we have but to arouse from our slumbers. The Creator has not made all things beautiful, that we should thus set a limit to our admiration; on the contrary, as all His works are offered for our enjoyment, so are they offered for our study. They are there to awaken a natural instinct implanted in us; viz., a desire to emulate in the works of our hands the order, the symmetry, the grace, the fitness, which the Creator has sown broadcast over the earth.

Mr. I'Anson, Fellow, said, that in making any observations on the paper read by Mr. Owen Jones, the real difficulty arose from the *embarras des richesses* which he had put before the meeting. It was clear that in Mr. Owen Jones' mind the eternal principles of ornament were simple and perspicuous. He had, however, understood that gentleman to say, that in none of Nature's works were to be found any but constantly flowing lines. Mr. Owen Jones was so completely master of the subject, that his views were, no doubt, substantially correct; but, with a view of eliciting discussion, he (Mr. I'Anson) ventured so far to differ from this remark as to observe, that in the branches of trees very angular lines indeed were often found, yet still producing great beauty of effect. So also in the decorative works of modern jewellers, and in the ornamental engravings used for the marginal decorations of poetry, &c., the combination of angular with curved lines was often employed with excellent effect. Mr. Owen Jones had also touched upon a subject which might occupy the Institute for more than one evening's discussion—namely, the possibility of originating a new style of architecture. He (Mr. I'Anson), for one, thought that the human mind, in the course of a moderate period, achieved in abstract science as high a development as could be attained; and he did not think anything more than the styles which had gone before could be achieved. He, however, threw out this remark rather as provoking discussion, than as laying down any law upon the subject.

Mr. Owen Jones explained that he had only intended to say that Nature abhorred an angle, not *the angular*. However angular the leading lines of any natural production might be, there was always a curve at their point of junction. Modern artists too often forget the curve, and put the angle instead.

Mr. M. D. Wyatt, Hon. Sec., thought it was but right, in justice to Mr. Owen Jones, to state that what he had read to the meeting was but an instalment of his views on this subject; and if it should be thought that any of his remarks required further illustration, it might be expected to be found in his complete work. Mr. Owen Jones should be congratulated not only on giving to the Institute one of the most interesting papers which had been read for some time, but also on the completion of the "Grammar of Ornament," a work which would add to that celebrity which he had already attained. The profession were already indebted to Mr. Owen Jones for their minute acquaintance with the works of the Moors in the Alhambra, and for the best illustration published in England of the Illuminated MSS. of the Middle Ages. In those works Mr. Owen Jones had shown the germ of that cosmopolitan spirit which, in his present publication, had produced the union of fruits from all gardens. Mr. Owen Jones had clearly stated that, in order to produce beauty, both curved and straight lines should be combined. This could not be done without intersections. The science of the contrast of lines was as interesting a subject as the contrast of colours, because it was as impossible to bring one line to impinge upon another in an opposite direction, without changing their mutual effects, as it was to contrast red with green, or blue with yellow, and to produce thereby no reciprocal results. He had no doubt that, in the expanded text of his work, Mr. Owen Jones would much more amply illustrate this point than he could do in the scope of his present paper.

The Chairman (Mr. Bunning, V. P.) said that, having listened attentively to Mr. Owen Jones' paper, he could not but express his delight at the great talent which it displayed. He was sure the members would all feel the same delight; and he trusted it would not be the last paper, full of good and sound sense, which Mr. Owen Jones would favour the Institute with. With regard to the use of ornament, he would only say that it should be either employed judiciously, or let alone altogether.

Mr. T. L. Donaldson, Hon. Sec. For. Cor., had great pleasure in proposing, especially as his friend Mr. Scott would have equal pleasure in seconding, the vote of thanks to Mr. Jones. He felt embarrassed, however, from the variety of topics embraced in Mr. Jones' paper. There was so much of instruction and of novelty in his remarks, that it was desirable to think and dwell upon them carefully and deliberately, rather than give expression to the ideas that arose in the mind at the moment. He concurred with Mr. Owen Jones that all ornament should be derived from nature, and also that in adopting natural forms, some conventionalism must be introduced. To merely copy any leaf, for instance, in stone or marble, would be incongruous and unsuitable to the material. The subject of imitation in art, in respect to painting and sculpture, had been ably treated by M. Quatremère de Quincy, who shewed how vulgar it was to copy literally natural objects. The highest effort of the mind, and the greatest proof of its creative power, was to be found, not in copying, but in the realization of certain impressions in a way that should not be different from that which nature had produced. In adapting any leaf or flower to the purpose of architectural ornament, some conventionalism must be used, not a mere caprice, but a good, sound, sensible, philosophical development, in order to make it answer the necessary purpose, and produce a similar impression to that of nature itself. Probably in Mr. Owen Jones' complete work this idea might be illustrated by taking any special plant, as the lotus of the Egyptians, the acanthus or the parsley of the Greeks. The lotus in particular afforded great variety of form for ornamental purposes, both in the leaves, the bud, and the expanded flower; and the Egyptians had most fully availed themselves of it. Mr. Owen Jones had touched upon a great number of other interesting topics, particularly the classification of ornament. He (Mr. Donaldson) thought that the Mediæval might with propriety be called the floral style, and the Elizabethan the geometrical. In the latter style, natural forms were copied in a most debased manner, and such as could not be put into comparison with the architecture of which it was supposed to be a revival. There were many other topics which arose out of Mr. Owen Jones' paper, but he should be ashamed to give expression to his immature ideas of them, and would therefore only beg to move the best thanks of the Institute to that gentleman for his valuable paper.

Mr. G. G. Scott, Fellow, said he should do very little more than to follow with an echo what his friend Mr. Donaldson had stated. The impression produced on his own mind by Mr. Owen Jones' remarks was not at all calculated to lead him to hazard any hasty expression of opinion. He would much rather carefully read what he supposed Mr. Owen Jones had put in print, and receive his instruction more maturely from such a second consideration of the subject. The only point on which he had intended to offer a remark had been anticipated by Mr. Donaldson; namely, the conventionalism of foliage. This was an excessively difficult subject, and it was hardly possible to determine the right principle. It might, however, be hoped that while each person earnestly worked in his own course they would get right in the end. The line of thought which he had himself generally followed, was based upon observing that during the Mediæval perod, up to a certain point, a purely conventional foliage was employed. This was not Nature conventionalized,—it was not derived from Nature at all: it was derived by imitation from the earliest periods of antiquity; from the Assyrians through the Greeks and the Eastern Romans or later Greeks, and thence from the Byzantines and the early Gothic artists; and this process of imitation had led to the exquisitely beautiful style illustrated on the present occasion by the specimen from Stone Church, Kent. Many other specimens of the same era existed, which were as beautiful as conventional foliage could possibly be. In France, however, at the middle of the thirteenth century (and in England a little later, about 1280 or 1290), that conventional system was abandoned, and a very direct imitation of Nature was adopted; but it appeared to him that the success which attended the change was hardly such as to bear out Mr. Owen Jones' remarks. The instances of copying in the latter part of the fourteenth century, to which Mr. Owen Jones had referred, were not direct imitations of Nature, and were in fact very inferior to the earlier specimens. The leaf upon the capital from Ely Cathedral (one of Mr. Owen Jones' illustrations), had no prototype in Nature. In the Sainte Chapelle in Paris, Nature was imitated absolutely, and there the effect was infinitely superior to the works of the latter part of the fourteenth and fifteenth centuries. The question, however, whether this direct imitation was equal to the earlier and purely conventional foliage, was not so easily settled. He himself thought the absolutely conventional was the best. The great point to which he wished to call attention, was that nature was the only source from which they had a right to copy at all. Beautiful as the specimen from Stone Church was (and there were thousands of examples equally beautiful), it would be wrong to *copy* any of them, but if they could invent an equally conventional foliage, they would do right. Until this could be done, they should study nature and how to conventionalize it;—as Mr. Donaldson had said,—philosophically. No conventionalism could be excusable for which there was not a reason. If leaves were more beautiful than any other object for ornamental purposes they should be adhered to; but it was natural to suppose that as they were not intended for ornaments for capitals (although they might suggest beautiful forms), some adaptation of them was essential to suit their forms to the place and the material in which they were employed, and especially to make up for the want of colour which they possessed in nature, and which must always affect any imitation of them. The little lines and markings of a natural leaf were merely the result of colour, and this was necessarily represented in carving by relief, more or less prominent; and this mode of conventionalism formed a style by itself. Another system of conventionalism was that of making ornament absolutely flat, so as to destroy all idea of relief, both being equally reasonable and philosophical. He thought Mr. Owen Jones' remarks a little too sweeping in speaking against the direct imitation of nature; but he agreed most entirely with him in the results which he was aiming at.

Mr. OWEN JONES in explanation, referred to drawings of columns and capitals from Wells and Ely Cathedrals. In the former, the leaves forming the capital appeared to spring from the combined shafts of which the pier was composed; whereas in the latter, the leaves were merely stuck on, and the more directly they imitated nature the worse was the effect. In the Egyptian columns and capitals, not only the natural forms were most gracefully conventionalized, but also the natural colours; the bloom of the lotus being rendered by the red and yellow margin to the form. Much might be done in the way of ornament by merely adopting any flower and endeavouring to forget the past.

Mr. SCOTT said, that in the use of leaves for ornament, two principles might be observed. In one case they might be used, as in the examples from Wells Cathedral and Warmington Church, in which they appeared to grow out of the shaft and support the abacus, promoting the fine effect of shooting upwards, which characterized Gothic architecture; and in the other case, the leaves were merely put on to architectural forms as a surface decoration. Both these methods were legitimate if properly employed, and both of them were illustrated in the Sainte Chapelle. He had great pleasure in most warmly seconding the vote of thanks to Mr. Owen Jones.

The vote was carried by acclamation, and the Meeting adjourned.

SOME NOTICE OF THE LATE JOHN BRITTON, F.S.A., HONORARY MEMBER OF THE ROYAL INSTITUTE OF BRITISH ARCHITECTS,

By M. Digby Wyatt, Hon. Sec.

Read at the Ordinary General Meeting of the Society, January 12, 1857.

Since its last meeting, this Institute, has suffered a notable loss in the person of its honoured Honorary Member, the late John Britton. It appears but due to his memory that, postponing for a short time all other subjects, the members of this Institute should take into their consideration the propriety of placing upon their minutes some brief record of their regret that one should have passed away from among them, whose life-long labours were dedicated to the illustration, graphically and historically, of those monuments which are at once our pride as Englishmen, and our noblest national models as architects. I have now, therefore, to ask your indulgent permission to bring a few circumstances connected with Mr. Britton's career under the notice of the meeting. The admirable biographical sketch which has appeared in "The Builder," written by one who followed to the grave last Thursday the "dear friend," in whose intimacy, unbroken for an hour, he had lived for some twenty years, has no doubt brought to the knowledge of the majority here present the salient features of a life of honourable toil, devoted to a worthy cause, and conducing to eminently successful results. I feel myself, therefore, absolved from alluding in any other than the most cursory manner to those early struggles, and that indomitable energy which changed the ignorant rustic into the elegant writer and brilliant speaker, whose society was eagerly sought by the most learned and noble of Church and State. The matter which specially concerns us is the influence wrought through the exercise of his energies upon the profession to which we have the honour to belong, and to that theme I purpose as far as possible confining myself.

John Britton was born in the year 1771, at Kingston St. Michael, near Chippenham, Wiltshire, of parents whose means enabled them to in no wise cultivate his natural abilities. Apprenticed by his uncle to a London Wine Merchant for six years, a complete barrier was opposed to progress in any other branches of knowledge than those within the range of an ordinary cellarman's acquisition. The liveliness of Britton's imagination however, and his inborn affinities for literary pursuits, led him through a series of struggles and vicissitudes to at length force for himself an opening into the world of letters. The acceptance by the Attic Miscellany of his first anonymous contribution to the columns of that periodical, and the friendship he formed in the person of Mr. Edward Wedlake Brayley, for one feeling his way already in the humblest walks of literature, fostered the rising passion. Finding employment in the compilation of song books and other trivialities for the notorious Fairburn, the Catnach of his day, he at length tried his "Prentice hand" on a volume in prose, on the subject of the lives and exploits of Cortez, Pizarro, and Columbus. He graphically describes in his autobiography the difficulties he experienced in the mechanical process of bookmaking, the analysis of authorities, the compilation and stringing together of facts and incidents, and the art of deriving suggestions from the writings of others, without sacrificing individuality and originality. Any confession of bewilderment on first encountering these difficulties is singularly interesting on the part of one, whose subsequent publications evinced an early and consummate tact in the very particulars that at first signally discouraged him. The success of his first volume engaged the attention of publishers of more standing and repute than Fairburn, and in 1801, he was employed by Mr. Wheeble, and Messrs. Vernor & Hood, to prepare for the press a work upon the "Beauties of his Native County." Written in a more popular style, and more agreeably illustrated, than any previous work of an analagous nature had been, the Beauties of Wiltshire met with a large sale, and established such a reputation for the author's topographical acquirements and capabilities, that he was selected by Dr. Abraham Rees to furnish the whole series of articles in the department of British Topography for the great and well known Encyclopædia, the publication of which commenced in the year 1802. Britton's anonymous labours, in connection with Dr. Rees, were continued at intervals during many years, and he in all contributed not less than 800 quarto pages to the Doctor's admirable work.

Between the years 1805 and 1814 he carried on the publication of his great work "The Architectural Antiquities," which, with the fifth volume subsequently published, cost in getting up £17,092. The edition extended to 1300 copies, of which about two thirds were published at £28. 12s. and one third at £43. The "Cathedral Antiquities," in 14 volumes, commenced in 1814 and terminating in 1835, was his next important work, involving an outlay of upwards of £19,000.

The fifth volume of Antiquities, by far the best work (and one of the least successful) produced by Mr. Britton, was published between 1818 and 1826. His association with Pugin began in 1823, in the "Specimens of Gothic Architecture," and the success of that well known work induced them to undertake the "Architectural Antiquities of Normandy." They next took up "London," of which upwards of 1000 copies were sold. This, which proved an unsuccessful speculation, was the last of the series in which these distinguished men co-operated. Mr. Britton on his own account gave his attention to the picturesque elements of our English Cities, bringing out a volume upon that subject in 1830; in this work he first used, to any extent, woodcuts as an auxiliary. His last important effort was made in getting up the "Dictionary," an excellent work, on which the Author bestowed great labour, and which he much regretted his inability, through unforseen circumstances, to carefully revise in a second edition. It is singular that of all his literary essays the two which were most popular, accepting the largeness of the edition as a test of popularity, were on subjects altogether uncongenial, it might be imagined, to his ordinary predilections. Of his Lecture on Railways no less than 5000 copies were struck off, while of an octavo volume of 239 pages written by him in 1807, with the singular title of "The Pleasures of Human Life, or the Miseries turned Topsy Turvy," 2000 copies were printed. During his long and laborious life he wrote and published about 11,000 pages, he caused to be executed upwards of 1700 line engravings, and mainly occasioned and directed an outlay of the great sum of £115,000. chiefly in the illustration of National Art and Antiquities.

To estimate the value of John Britton's labours aright, we must remember that before his time popular topography was unknown. The ponderous volumes of county histories were valuable as record rooms, but useless as libraries. The text books—Gough's Camden, King's Munimenta Antiqua, Cox's "Magna Britannia," and Buck's "Castles," were heavy and opaque. The facetious Captain Grose was the leading antiquary, and Gilpin furnished a sample of the florid style of picturesque description of scenes and localities. Price, Knight, and Repton, did much to draw attention to other details than those of genealogies and the descent of hereditaments. Any thing however, like a fusion of the two styles had not been attempted at the period when John Britton commenced combining antiquarian with topographic description. The pictorial illustrations of our national monuments at the close of the last century were of the most loose and imperfect description. Since the careful prints of Hollar, scarcely any engravings of architectural subjects had appeared worthy of notice or reliance; and the early productions of the Antiquarian Society presented the only approximation to accuracy. James Basire, Rooker, and Lowry, were the fashionable engravers of such subjects, and John Carter, and Fowler, who illustrated stained glass and antient mosaics, almost the only trustworthy draughtsmen. It was mainly through John Britton's energy that a reformation was effected. His activity and enthusiasm soon gathered about him all those rising men whose names are now so familiar to us. He saw from the improvements which had been effected, mainly by Stothard, and Heath, the engraver, the capabilities of copper plate engraving; and speedily brought to bear upon the long neglected antiquities of the Country, that artistic ability through the exercise of which they could alone be popularized. Samuel Prout, Frederick Mackenzie, Edward Blore, George Cattermole, W. H. Bartlett, R. W. Billings, Henry Shaw, and many more, were at various periods induced to bestow their earnest efforts upon the proper delineation of those views which were so successfully transferred to copper by the brothers, John and Henry Le Keux, and other engravers, for the most part pupils of Basire. Public attention was captivated by the excellencies of the engravings of the Architectural Antiquities of the land, and the excitement which at first took the form of vague admiration, has in our time reached its happy consummation in profound investigation into the true principles upon which they depended for grandeur and effect, and in a wise and wholesome spirit of conservancy. For much of this, the country is deeply indebted to that friend we have so lately lost. His labours were incessant, his memory extraordinary, his system admirable, his clearness of understanding, and liveliness of fancy in no common wise vigorous, his affections warm, his habits exemplary. Had he been less honest he might have been far richer; had he been more selfish he would never have benefited his country as he unquestionably did. Were abundant time at my disposal, I could scarcely condense into an evening's discourse an enumeration of the great variety of subjects which engaged his active attention. It must be manifest, therefore, that John Britton's claims upon our gratitude are infinitely more weighty and numerous than words of mine can urge upon the present occasion. I can only sum up this hasty tribute to his memory by an expression of my confident belief that he was to this country infinitely more than that other great archæologist, whose loss we have had to deplore this session,—Canina—was to his. It may not be unsatisfactory to the Institute to know that Mr. Britton, who died January 1st, at the age of eighty-six, was followed to his grave by a deputation representing the Council of this body, and consisting of his old and valued friends, Mr. George Godwin, and Professor Donaldson, and your indefatigable Honorary Secretary, Mr. C. C. Nelson.

ON THE RUIN OF HEIDELBERG.

By E. I'Anson, Fellow.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, Jan. 12th, 1857.

Last Session I had the honour of reading in this room a Paper describing some of the principal Chateaux of the Renaissance period in France; and I have now to bring under your notice the well known Chateau of Heidelberg, a work of the same period in Germany. Besides the Belvedere on the Hradschin, at Prague, built in the latter half of the sixteenth century, the portico of the Town Hall at Cologne, 1569-1571, and the Town Halls of Augsburg and Nuremberg, both of the beginning of the seventeenth century, I am not aware whether that country contains many palatial monuments of that time and character; but if, as I believe, it is not so rich as France in this respect, this one monument is so fine and so well preserved as to afford an excellent opportunity of comparing it with buildings of similar character and the same age in that or other countries. As a picturesque ruin Heidelberg is highly appreciated by the many tourists on the Rhine; its beautiful situation, its perfect condition as a ruin, its rich deep tone of colour, its aspect embowered in thick woods, the towering background of wooded hills, the bold craggy base of rock, the quaint forms of the town of Heidelberg stretched out below, and the rich landscape which extends beyond westward to the valley of the Rhine, traversed by the noble river Neckar, all unite to excite in the mind those sentiments of romance which we experience in looking back to what has been, in contemplating the ruined monuments of our forefathers.

The landscape over which the eye wanders is classic ground, for the distance beyond the Rhine includes the rich flat alluvial plain in which the formerly important towns of Spires and Worms are situated; it is a district immortalized in the Niebelungen Lied, and the Minnesinger called it Wonnegau, or the Land of Delight,—another instance of the very different manner in which beauty of scenery was understood in Mediæval times. As to the ruin of Heidelberg itself there can however be no question; for certainly I never in any place saw so many artists, expressing their appreciation of the romantic interest of a locality, as might be fairly inferred from the numbers who were seeking to record on their tablets the beautiful effects of this noble ruin.

The building is still in its general features very perfect, and although quite a ruin, is in some parts so well preserved that there is enough to indicate its former well studied magnificence; it is yet so much of a ruin, and so indicates the rude agencies of war or time by which it has been partially destroyed, as to furnish abundant scope to the imagination, and in its mingled groups of ruined strength and graceful beauty to afford the most picturesque combination of form, light, and colour.

The carriage approach is by a winding road on the south side of the building. There were formerly outposts and two fortified outer courts to pass before reaching the gate. The entrance is over a narrow bridge through a gateway (in which the portcullis still remains suspended) into the inner court. But the more interesting approach is by a steep and picturesque path through a hanging wood, and thence through a subterranean part of the building to the north terrace, from which a partial view of the buildings, and a first impression of their characteristic architecture, are obtained.

The Castle of Heidelberg was built by the ancestors of the present reigning family in Bavaria. The first foundation of a castle at or near the locality dates back earlier than the fourteenth century, and down to 1801 it was still held by descendants of the family by whom it was built, but at the Peace of Lunéville, it (together with the Palatinate of the Necker) was incorporated with the Grand Duchy of Baden. It is recorded that a certain Conrad von Hohenstauffen, brother-in-law of the Emperor Barbarossa, had his domicile near the site of the present castle in 1142; of this however all material trace has ceased to exist, it having been entirely destroyed, as its more modern successor has been ruined, by lightning firing a powder magazine, which it contained, in 1537. The foundation of the present building is attributed to Rudolph I., Count Palatine, who commenced it in 1319, and whose son continued the works. In 1329, at the Treaty of Pavia, the building is first conspicuously mentioned. In 1346 its then owner added a chapel since destroyed, he also formed the fine platform called the Galerie du Chateau, cut out of the hill side towards the town. Robert Count Palatine, who became Emperor of Germany in 1400, enlarged the building, but the addition necessary to accommodate the Court of the Emperor did not notably increase the Castle Palace of a Count Palatine. In 1415 it became the prison of the Pope John XXII. It was further enlarged by Count Louis III. some time before his decease in 1436. Louis V. between 1508 and 1533, made the important addition of the Great Round Tower, and the still more important one of the Great Terrace, which rises to a very great height on the precipitous side of the mountain. Frederick II. his brother, who succeeded him in 1544, built more than any of his predecessors, and completed the works still left imperfect. The walls which united the Square Tower with the Tower of Frederick the Victorious were raised and thickened in 1545, and following his brother's example, but with much more magnificence, both within and without the old palace, he continued the stone facings to the older parts. The Round Tower which Louis V. had erected near the Chapel of Jetta was improved by him, and several upper stories added. In 1554 a large bell was placed in the tower, after which it was called the Tower of the Bell until its ruin took place; it then continued to receive additions from its successive owners until the seventeenth century, after which it was several times devastated during the 30 year's war, 1618—1648, and nearly ruined in the war of Louis XIV. 1689—1697, but it was restored after each of those periods, and fell ultimately into its present state of ruin, not from the effects of war, but from one of those visitations of Providence over which man has no control. On the 23rd of June, 1760, it was struck by lightning, and for the most part destroyed, and since that time it has never been restored.

I now pass on to a more particular description of the ruins, beginning with the oldest part of the building. Next the court yard is a fine projecting oriel window, a feature more common in Continental Mediæval architecture than it is in England. There is a very fine example in the principal front of the Chateau at Blois, there are numerous examples in Germany, as at Prague, and in the later domestic architecture of Franckfort, Mayence and other towns, and it is not wanting in Ecclesiastical architecture, of which a very good specimen of the date of the sixteenth century occurs in the Church of Saint Mary at Cologne. This part of the building formerly contained three vaulted stories, now entirely reduced to ruins; the evident solidity of its original construction may be taken as sufficient evidence that more than ordinary violence must have been used in its destruction.

The building of Ruprecht, Elector Palatine and King of the Romans, was constructed by him in the year 1400; restored by the Elector Louis V. in 1540; embellished by his brother Frederick II., and devastated in the Orleans War of 1689. It is also in a very ruined condition, but has on the face next the court yard some fine fragments of carving, chiefly armorial bearings, which, although much decayed, bear in parts the evidences of having been formerly gilt. Under one of them is an inscription to the effect that—

One thousand four hundred years were counted,
When Count Ruprecht was elected
King of the Romans. He reigned 10 Years,
And constructed this Building,
Which the Count Palatine Louis repaired
Such as it now is.
It was in the Year 1000. 500. and 44,
When he himself was taken away from this world.
May Christ Jesus give peace to the souls of both of them.

Some traces remain internally to show the different levels of the vaulted floors, and some of the sculptured corbels for the springing of the groined arches. There are also the remains of a fine sculptured chimney piece which ornamented a room formerly existing, and bears the date 15(CF)46. This chimney piece presents a decoration remarkable on account for its unsuitableness to a room used for festive meetings, as it represents, in an allegorical form, the inevitable end of this life and the commencement of the next—an allusion to a solemn truth according but little with the ordinary uses of a festive hall.

Next follow buildings used as dependencies to the principal buildings, and built by the Elector Palatine, Louis V, in 1520. They remained uninhabited after the Court of the Elector removed to Manheim, and so continued until almost totally destroyed by the conflagration of 1764. Part has since been occupied by the people employed about the ruins. There is no architectural feature of any value to distinguish them externally, and internally it is difficult to make out amongst the mass of ruins the destination of the various rooms, except the kitchen, by its chimney and the ovens.

The portion called the Building of Louis, was built by the Elector Louis V. in 1521; injured by fire in the Orleans war of 1689; repaired by the Elector Charles Phillip after 1716; and destroyed by lightning in 1764.

The part called the Palais of Otho Henry, containing the Ritter-saal or Knights' Hall, is the richest portion of the castle. It was began by Frederick II. in 1549, and terminated in 1559 by Otho Henry. During the thirty years' war, this building suffered much, and also from a fire in 1634. It was restored by the Elector Charles Louis in 1659; further injured in the Orleans war, 1689-1693, but afterwards restored. Either the injuries sustained on the side of the court yard must have been very trivial—as was probably the case—or the restoration was executed with uncommon ability. It was finally destroyed in 1764, together with the other portions of the building, by the catastrophe already mentioned.

The west façade, that next the court, is a very remarkable work, and I know of no piece of Palatial architecture which surpasses it, or even equals it in richness of decoration, notwithstanding the ruin to which it has been exposed. So much as remains is still in a very fine state. The masonry is well and solidly executed, and the stone remarkably perfect, the delicately sculptured decorations being even now in a good state of preservation.

It would be tedious to enter on any lengthy account of the several portions of this façade. An inspection of the photographs and the engravings will best explain its leading features. The general proportions are very satisfactory, as well as the grouping of the windows and the horizontal divisions of the string courses and cornices; it is placed on an elevated basement, and the whole is on a scale sufficiently large to make it a noble and imposing front.

The details of the pilasters, cornices, and dressings to the windows, shew a wide departure from classic proportions, and are not happy, but there is an exuberant richness of decoration conceived and executed in the very best manner, which more than redeems these defects, and is worthy to rank with the best work of the same time in Italy. As a very near approximation in Italian work, I may refer to a chimney piece forming part of the Soulages' Collection now in this country, of about the same date. I do not, however, claim for it all the grace and delicacy of some of the highest class work of that country, but it is very masterly, not only in the arabesque, but in the supporters and other figure decorations of the armorial bearings, both animal and human, nude and draped. The central doorway, once approached by a fine flight of steps, with caryatides supporting well-proportioned entablatures, and remarkably rich, effective, and skilfully treated armorial bearings above the door, is a very remarkable and artistic work.

The tower of the Library, or the Apothecary's Tower, was constructed in the years 1550—1554, by Frederick II.; injured by fire in the second assault on the castle during the Orleans war in 1693; restored by Charles Philip after 1713; and finally ruined by lightning in 1764.

This tower was not entirely circular, but it was square next the buildings last described. It was built of great strength, as it formed an important part of the defence of the castle. The number of windows, nine on each story, is, however, very considerable; the motive, no doubt, was to obtain the necessary light for the valuable library which it was destined to contain, which, however, it did not long retain, as the succeeding Electors gave it to the neighbouring University of Heidelberg. Nor was it allowed to remain there, for it was taken in 1622, in the thirty years' war, by General Tilly, who commanded the Imperialist and Bavarian forces, and given by Maximilian, Duke of Bavaria, to the Pope, who transported it to Rome, where it still remains in the Vatican, arranged in several rooms, under the name of the Bibliotheca Palatina. Forty-two of its manuscripts were esteemed of sufficient value to be carried by Buonaparte to Paris, but on the general restitution in 1815, the University of Heidelberg claimed and obtained them, and, encouraged by their success, they applied to the Pope for the remaining part of their ancient treasure; the appeal was so far responded to, that they obtained the German manuscripts, making, with those recovered from Paris, more than 1000 manuscripts.

The original collection is said to have contained several thousand valuable Greek manuscripts, but they were much injured and many destroyed in the siege by Tilly, by whom they were used as litter for his cavalry horses.

This fine and costly collection of books recals that made, nearly at the same time, for the Chateau of Fontainebleau by its liberal founder Francis I.

The new buildings of Frederick II. were built on the foundations of a much earlier building, and intended at first for the library; they were burnt in the war of 1689, restored by Charles Philip in 1716, and destroyed in 1764, but since then they have been in great part refitted, and are now used partly as a habitation and partly as a museum, containing some relics connected with the castle and its founders. That part of the building which has not been restored is altogether in a state of ruin; the exterior fronts are plain, like all the rest of the building, but there is one fine projecting bay window on the east, which gives much character to this part of the building. The interior façade is, I consider, remarkably elegant; it contains an open arcade, the lower part composed of two very elegant arches formed of portions of parabolas, with a double story of arcades above of four arches on each story; the spandrils between the lower arches are decorated with very finely carved emblazoned shields surrounded with wreaths of foliage. The centre shield is dated 1549, and on the riband which surrounds it are the letters D. C. V. said to be the initials of the sculptor; on the left hand side are the armorial bearings and initials of the Count Palatine Frederick; and on the other the arms and initials of the Electress, Dorothea, Princess of Denmark. Above this there formerly existed another arcade, no trace of which remains.

The use of the lofty narrow gabled slip which completes this part of the building on the left is not exactly known; it is very strongly built, every floor was vaulted, all the windows barred, and its projection from the other parts of the building must have allowed of its being observed on all sides; it has been conjectured that it may have been used as a treasure house. The upper part of the gable is richly decorated with ornament, giving a more graceful outline than the ordinary step gable; and below is a sun dial, which was a very common decoration all over Europe from the sixteenth to the eighteenth century.

Of the old arsenal nothing but the lower part of the walls remains; it was built in 1455, devastated in the Orleans wars in 1689—1693, and destroyed in 1764; since then it has gradually lost all form of a building.

The Clock or Bell Tower—or octagon Tower, was built in 1525, by the Elector Louis V.; it was raised by his brother and successor, Frederick II. in 1545-1547, in order to receive a bell; and was restored or repaired by Frederick IV. in 1608. It suffered severely in the thirty years' war, and particularly in the years 1632, 33, and 34; it was repaired and embellished by the Elector Charles Louis in 1655, again greatly injured in the Orleans wars from 1689 to 1693, and was the first portion of the building destroyed by lightning in 1764. This tower forms the most picturesque object in the views of the castle; it still retains five out of six of its original stories, and the turret staircase communicating between the several floors, is still tolerably perfect; when complete with its additional story, high-pointed roof, and mullioned window, it must have been a very fine monument.

The Palace of Frederick IV., or Chapel of St. Ulrick, was built by Frederick IV. in 1601-1607. It was damaged in the Orleans war of 1689, repaired by Charles Phillip in 1716, and finally much injured by the fire of 1764; but the chapel was roofed and partially restored, and did not totally cease to be used until the early part of this century—1803. This building, though forty or fifty years later than that of Otho Henry, is much in the same style, and contains the same number of stories, and general arrangement of parts. It is not generally so much admired as the more decorated eastern building; as it is not nearly so elaborate in its decoration, which is certainly not so chaste; but there is greater dignity in its composition, and more perfect proportion in its parts; and the north front, which is less decorated than the south front towards the court, and where the statues are wholly omitted, is as fine, or indeed a finer composition than anything of the same date with which I am acquainted, the lower part especially. The basement or podium, and the grand floor on both fronts, are full of force and fine character.

The Tun Room, part of the palace of Frederick V., was commenced by Frederick IV. between the years 1601 and 1608, finished by his son and successor, Frederick V. from 1610 to 1619, and burnt in the Orleans war, in 1689. Of the celebrated Tun it is not necessary here to speak; its wooden framework is handsomely constructed, but its dimensions are, I believe, much surpassed by some of the wooden vats used in the London breweries.

The Gallery of the Chateau was originally built in 1346, and remodelled in 1601-1607, when the palace of Frederick IV. was built, but the balustrade and corner turrets are of later date. This terrace, which is the first part of the building reached in ascending from the town by the footway, already mentioned, is in itself a very noble work, the imposing north front of the castle bounds it on one side, and on the other there is a most charming view, extending over the valley of the Neckar, and the town of Heidelberg almost immediately below.

The Building of Charles Louis, was constructed by that Prince in the second half of the seventeenth century on the ruins of the old chapel of the castle, and destroyed in the Orleans war in 1689—so that nothing now remains but some portions of the ancient building which served as its substructure.

The ancient well of the fortress is covered by a portico, the columns of which were taken by order of the Elector Louis V. from the ruins of the palace of Charlemagne at Nieder Ingelheim. They are the remains of a hundred similar columns of granite, brought out of Italy by Charlemagne. The capitals and bases were added in the time of Louis V. in 1355.

The Tower of the Great Gate, or Tower of the Giant was finished by the last named Prince in 1355. The sculptures on the outer face of this tower are considerably later, being of the date of 1541, and were evidently designed with reference to the feudal tower to which they are attached, for although of the same date as the best Renaissance work about the castle, the style is totally different. The lions formerly supported shields of metal let into the wall; it is said they were of silver, but no traces are now left, except the recesses which they occupied. The approach to this gateway is over a narrow bridge across the deep and beautiful ravine which surrounds the castle.

The Riven Tower was once called the Tower of Frederick the Victorious, by whom it was built 1450-1460. It was restored or repaired by the Elector Frederick IV., and destroyed by the explosion of a mine in the Orleans war in 1689. The walls are twenty feet thick, and it contained three stories of batteries, some of the rings used for working the cannon being still visible. The fallen portion of the tower, which has slipped in one huge mass into the fosse below, and is now partly concealed amongst the stems and foliage of the trees, is strikingly picturesque.

The Elizabeth Gate gives access to the terrace, built by Frederick V., and dedicated, according to the inscription, to his beloved wife Elizabeth, in the year 1615. The arch has twisted columns in the shape of trunks of trees, covered with creeping foliage, with richly foliated capitals, and an ingenious display of lizards and serpents on the shafts; but the whole composition is meagre and in bad taste, notwithstanding the ingenuity of the sculpture with which it is lavishly decorated.

The great Rampart of the castle, a truly colossal work, raised from the ground below on four or five stories of vaults, was formerly used as an outer battery, but in more modern times as a magnificent esplanade.

The Great Tower was built by Louis V., in 1533, and ruined by the French in the Orleans war, on the 16th February, 1689. This was even more massive in its construction than the tower of Frederick I., and is said to have been when complete one of the highest in Europe.

I feel it right to observe that I have availed myself of the description published by Monsieur de Graimberg for all the details I have been enabled to offer, and that the prints on the walls form part of a work published by him. This gentleman, many years ago, seeing how totally the building was neglected, constituted himself the guardian of the place; he has collected a very respectable museum; and his unwearied attention has done much to arrest the further progress of decay.

In this building there is certainly much to remind us of the style commonly called Elizabethan, which prevailed in this country from the time when Longleat was built, until that in which the works of Inigo Jones, and especially his façade of the banquetting house at Whitehall, in 1619, opened the way to a new era in architecture. There is not an unfrequent application of the strap ornament and the flat jointed band, which are applied as decorations to the pilasters, particularly in late buildings of the beginning of the seventeenth century. There is also the same somewhat exaggerated entasis of the pilaster, but all the features are much more boldly marked than with us; the strap ornament, for example, is made to project in bold masses at its extremities, so as to produce great variety of light and shade—the flat-jointed bands are not so small or complicated, nor so much like panel-work, as in our specimens at Holland House or Dorton House, 1596.

The entasis of the pilaster assumes a remarkable boldness, and gives great vigour to the Doric order used in the lower story of the north front in the building of Frederick IV. The same feature I have observed in one of the buildings at Strasburg, but nowhere else so effectively carried out. The use of the reversed column or pilaster is comparatively rare in the German work, and then only in very subordinate features. The niche with the peculiar shell form of the head, which is also not uncommon in French buildings of same style, takes the place of the flat arched pannel with which chiefly the interior of our Elizabethan, is frequently decorated.

The departure from the previous national type in France is less decided in outline and general form than with us—for the French retained the lofty roofs of the late Gothic, and the Castle of Heidleberg has its stepped and decorated gables as all the old houses had from Vienna to Antwerp, while the English adopted a substitute for the Italian balustrade and level cornice, for which it must, however, be admitted that the flat roofs and embattled parapets of our later Gothic had prepared the way.

There is throughout these buildings no want of evidence of a very rude departure from the proportions and rules of classical architecture, or it might perhaps be more properly said that classical models were crudely and ill-applied. The façade of Otho Henry, next the Inner Court, although full of beautiful work, is especially full of such defects—the attenuated proportions of the Ionic pilaster—the disproportionate height of the window pediments, and the setting back of the molded head behind the horizontal cornice below, are all crudities which show but a very imperfect acquaintance with the Italian types of the age, or at least an imperfect power of applying them; but apart from these defects the general balance of parts is very happy, and the decoration generally in very good taste.

The ornament, indeed, of this period appear to me the most perfect which has ever been used for architectural purposes; being sufficiently conventional to be used as architectural decoration, and yet sufficiently approaching to natural forms to suggest the vigour and movement of life, the flow even of sap in the veins of the plants, and more developed life in the lizards and birds which fill up the blank spaces in the leafage.

The finest specimens of this kind of decoration are certainly to be found in Italian work, of which there are many beautiful specimens in the Renaissance Court of the Crystal Palace, the most perfect in my judgment, in matter of ornament, being in the two doors in the screen next the central nave; the case of one is copied from a doorway presented to the Doge Andrea Doria by the Senate of Genoa, and supposed to be the work of Pierino del Vaga, who was engaged with Raffaelle on the Loggie of the Vatican, which work he left in 1527.

The decoration which, however, I would more particularly mention, is that of a small ornament inserted next the pilaster of the door from the church of Santa Maria dei Miracoli at Venice: it is perfect of its kind and entirely free from the less happy compositions of the same time, in which, as in the decoration in the Vatican, satyrs, cupids, and monsters, supported on impossible bases, balance each other on opposite sides by a stiff central stem. In the frame of one of these doors is a fine frieze from the tomb of the Cardinal d'Amboise, at Rouen, of the date of 1520–26; it is not a work of the same delicacy as the Italian one just referred to, but it displays great beauty and masterly workmanship.

The works I have been referring to at Heidelberg are, as a whole, worthy to be classed with any of the Renaissance school. They have well marked individuality of character, fine taste in ornamentation, and are unrivalled in the adoption of heraldic decorations. So far as I know, they are superior to any we have in England, fit to stand in equal rank with the best works of France, and not unworthy examples of the style which grew up in that great cradle of the arts in modern times—Italy.

Mr. Digby Wyatt, Hon. Sec., observed that, considering the early period at which German artists went to Italy to study, and carried the Tedesco style into that country, it was remarkable that after their return home, Germany should have been the last to adopt the features of the Renaissance style in architecture, and then even to a much less extent structurally than any other country in Europe. The principal artists in the Renaissance style in Germany were the family of Fischer, both Peter Fischer and his sons having studied in Italy; and it was through their examples at Nuremberg and in its neighbourhood, that the Renaissance style was introduced into Germany. These, however, were only examples of the details of the style. Mr. I'Anson had enumerated all the principal examples in Germany, and not in one of these were the revived antique orders carried out in their integrity. The town hall of Cologne was in a very vitiated style, the columns throughout resembling a row of very thin gentlemen placed close together. In Heidelberg Castle there was very little attempt at a regular Order. It was further somewhat curious that at the very time Peter Fischer was executing his best Renaissance work, some of his contemporaries and imitators continued to work in the Gothic style; and the wood engravings of the period shewed the disinclination of the Germans to adopt a pure Renaissance character. The arts of engraving on copper plates and armour, as well as of damascening, were transferred from Florence, Milan, Venice, Ferrara, and other cities of the North of Italy to Augsburg and Nuremberg. A picturesque style was subsequently adopted which had not inaptly been designated "the Rubens'"; for in it wood, stone, brick and plaster were alike made to assume that rotundity of form allied to a general heaviness of proportion frequently to be observed in the paintings of the great Sir Peter Paul. Under these circumstances it was peculiarly interesting to dwell upon one of the very few monuments of Germany presenting the characteristics of Renaissance art.

Mr. Scoles, Fellow, had rambled a few months ago over the castle of Heidelberg, but without the opportunity of studying it so carefully as Mr. I'Anson had. He quite concurred in the opinion that the Renaissance style was never acclimatized in Germany, the details being much inferior in delicacy to those of France. Heidelberg, however, must always be admired for the beauty of its situation, its palatial grandeur and its picturesque effects.

The Chairman, Mr. G. G. Scott, V.P., said, that he had not studied much the interesting question of the different ways in which the revival of classical architecture shewed itself in different countries. In Italy it appeared that the general form and outline of buildings had never departed much from the classical model. At a very early period, buildings assumed an absolutely classical form, but the details remained until long after of a Gothic character. North of the Alps the contrary was the case. There, the details were meant to be classical, whilst the general form was farther removed than ever from the classical type, as if the country was resisting with all its might the adoption of the new style. He differed somewhat from the opinion of Mr. Wyatt, that the Renaissance style had not been common in Germany. In the street architecture of that country, the style prevailed to an enormous extent. A profusion of gables and other forms, of every shape that imagination could devise, and as far from the classical outline as could be conceived, distinguished these German houses. The Town Hall of

Bremen was especially remarkable for its immense towering gables, and the intricate forms of the detail. Every imaginable fantasy of ornament was introduced, and there was not a foot of plain surface throughout. At Hamburgh and other towns the same features were found, proving, as he thought, that the style had pervaded the country to a great extent; and that, instead of being poor in Renaissance art, Germany was full of the most gorgeous specimens of it, although the detail was not equal to that of France and Italy.

Mr. Digby Wyatt said, that he ought to have made the distinction between the kind of art produced by the struggle with Gothic architecture for the admission of the Renaissance, and that of the period when the antique was imitated with exactitude. The majority of the buildings referred to by Mr. Scott were based as to their main structure upon ordinary Mediæval practice, and as to their details, which were of a debased cinque cento character, upon the precedents for the design of ornaments of every description, made popular by the class of prolific engravers known as the "Petits Maîtres," such as the Behams, the Hopffers, Theodor de Bry, Virgil Solis, Altdorfer, Aldegraever, and others. These were the class of men who multiplied patterns of application for the Renaissance forms to every branch of art and industry throughout Europe, during the end of the sixteenth century, and the whole of the seventeenth. He believed, therefore, he was correct in saying that there was exceedingly little pure Renaissance architecture in Germany. The gables and other features referred to by Mr. Scott, belonged to what he (Mr. Wyatt) had termed the Rubens' style, the houses themselves being mostly of lath and plaster, and the designs founded upon the school of facile drawing which arose from the engravings already mentioned.

A vote of thanks to Mr. I'Anson having been carried, the Meeting adjourned.

A DISCUSSION ON THE VARIOUS METHODS OF INDURATING AND PRESERVING STONE-WORK,

At the Ordinary General Meeting of the Royal Institute of British Architects, January 26th, 1857.

Mr. Henry M. Witt, F.C.S., Visitor,* read the following remarks:—The decay and preservation of stone being in a great measure a chemical question, it is very necessary that an architect should be acquainted both with the first principles of the chemical action of the air in the disintegration of the different stones, and with those which should guide him in forming a just opinion on the various processes suggested for their preservation; so that he may neither be led away by the specious statements of interested parties, nor induced to pass a hasty condemnation on all alike, without either understanding their mode of action, or testing them by experiments of a decisive and satisfactory character.

The destructive action of the atmosphere upon the various kinds of building stones, may be classified under two heads. In all cases it is the solvent action of water and carbonic acid which effects the decay. These agents affect stones in different ways, according to their composition, which, however, may generally be referred to one of two classes, viz., the earthy carbonates, and the earthy and alkaline silicates.

Under the first named may be included the larger number of common building stones, the limestones and dolomites of the "oolitic" and "magnesian limestone formations," which are chiefly carbonates of lime and magnesia, and also the sandstones, for in these the sand is agglutinated by carbonate of lime.

These neutral carbonates of lime and magnesia are insoluble in *pure* water, and would remain entirely unacted upon if the atmosphere consisted only of pure nitrogen, oxygen, and aqueous vapour; but it always contains carbonic acid, which being soluble in water is carried down by the rain, and these earthy carbonates are dissolved in an aqueous solution of this acid; moreover, whenever rain falls upon a surface of carbonate of lime ($Ca\,O, CO_2$) a portion of it is dissolved in the form of acid, or bicarbonate of lime ($Ca\,O, CO_2; HO, CO_2$), hence the presence of considerable quantities of carbonate of lime in spring and river waters passing through chalky and limestone districts. If, however, the temperature of such solutions be raised, or if they be long exposed to the air, the carbonic acid is evaporated and the carbonate of lime precipitated; it is thus that incrustations of natural objects met with in the neighbourhood of these springs are formed. A curious illustration of this fact I have also observed when examining the action of the weather on the south-western side of the Church of St. Luke, Chelsea; wherever there is a sloping ledge the rain, in running down, has dissolved a certain quantity of carbonate of lime in the form of bicarbonate, but on arriving at the edge it has collected in drops, or been drawn under it by capillary attraction, and being prevented by the same force from falling to the ground, it has remained a sufficient time exposed to the air for the carbonic acid to evaporate, and the carbonate of lime to be deposited in droplets or miniature stalactites: this is doubtless a common phenomenon, which has been frequently observed, but it is an interesting proof of the accuracy of our views respecting the action of rain water upon such stones, for there we have the very same carbonate of lime which has been dissolved out of the edifice in one place, deposited in another.

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* Asst. Chemist, Government School of Mines.

The granites, porphyries, clay slates, and such minerals, are acted upon by the atmosphere in a different way; the general nature of the process may, however, be well illustrated in the case of granite, a rock which being often very hard is popularly deemed indestructible; but that such is far from being the case is obvious in the weather-worn crumbling surfaces of the masses of granitic rock on our own coasts, as in Cornwall. The action of water and carbonic acid on granite is different in nature and *slower*, but as certainly destructive ultimately as in the case of the limestones.

The composition of granite, or at least of felspar its largest constituent, may be thus represented $(KO,\ SO_3;\ Al_2\ O_3,\ {}_3SO_3)$, that is to say, a double silicate of potash, and alumina; and when carbonic acid, dissolved in water, is brought repeatedly in contact with it, the potash is dissolved out from the silicate of potash in the form of carbonate of potash, leaving the silica in a flocculent partially soluble state; the silicate of alumina, though unacted upon, is left in a disintegrated state; so that by the mere agency of air and rain water the massive rock crumbles to powder.

The foregoing remarks apply to the action of the pure air of the open country upon stones. These are destructive influences to which all buildings, even in the purest and most serene atmosphere, are constantly exposed, and from which no stone, however good and well selected, can be free. But in large towns, where enormous quantities of coal are burnt, stone is subjected to far more adverse influences; the particles of carbonaceous matter (soot) constantly floating about in such an atmosphere, are carried down by the rain, deposited on the stone, and there cemented by the carbonate of lime which is simultaneously precipitated, in consequence of evaporation from the rain water in which it had been dissolved off other parts of the building in the form of bicarbonate. Thus the buildings become covered with a funereal encrustation, producing that sombre appearance which occasions such a striking contrast between the public buildings of our metropolis and those of Paris and other continental towns where wood is the common fuel. This coating, though marring the beauty of the architecture, conduces to a certain extent to the preservation of the stone by forming a layer impervious to water, and thus preserves the subjacent carbonate of lime from further contact with the acid solution. Sometimes, however, moisture penetrates through cracks in the surface layer and permeates behind it, then dry or frosty weather setting in the coating becomes loosened and whole masses fall off at a time; the result is necessarily very destructive, but it is one which may be frequently observed. Moreover the atmosphere of these coal-consuming districts contains, besides carbonic acid, also sulphurous and sulphuric acids, which act upon carbonate of lime much more energetically and in a more injurious manner than the carbonic acid.

Some stones being more readily acted upon by these agencies than others, on account of peculiarities in their physical structure, with which the architect can only become familiar by practice, it is obvious that the utmost caution should be exercised in the choice of stone for public buildings; nevertheless, since even the best selected stones are liable to and must ultimately yield to the same destructive agencies, the difference being only one of degree, it is but natural that attention should have long since been drawn to methods for preventing the mischief; many of which, to judge on chemical principles, merit the serious attention of the architect, and the most unprejudiced trials.

They may be divided into two essentially distinct classes. In the one the object is to cover the stone with a layer of some material, organic or inorganic, vegetable or mineral, having no chemical action on the stone itself, but serving only to cover it with a surface, which not being affected by, or having a repulsive action towards water, shall preserve the subjacent stone from the contact of the acid solution, just as wood is preserved by a coating of paint. Although these methods vary much in detail, they have all the same object and are all more or less useful, though less valuable than the second class of processes to be hereafter alluded to.

The most obvious method is to cover the building with a coating of paint, as in the case of the new façade of Buckingham Palace. This is obviously better than allowing the stone to decay, but it is a very temporary expedient, and liable to the objection that, if the paint be made of lead, it speedily becomes black from the sulphuretted hydrogen of the atmosphere of an English town.

Many patents have been taken out, to which Mr. Smith alluded at length in his paper, read here on the 1st ult., which consist in soaking the stone in, or covering its surface with, a layer of an oily body of some kind: motives of cheapness and convenience may, to a certain extent, influence the selection. These are all valuable for a certain length of time. So long as the oily coating does not itself decay, it must afford important protection to the stone beneath; and no doubt there are many here present who can testify to the practical value of one or other of the processes of this class which have been suggested. But it must not be forgotten that all vegetable bodies—indeed, organic compounds generally—are subject to a process of decay, quite different in character from those to which I have before alluded. All these bodies, which consist essentially of carbon and hydrogen, are combustible, and, when burnt, are converted into carbonic acid and water (the compounds of these two elements with oxygen—viz., CO_2, and HO), and, by long exposure to the air, the very same result ensues, only more slowly; so that in process of time they entirely disappear, being converted into invisible gases, and no trace of them remaining. Their action can therefore be but temporary, their durability being, in fact, considerably less than that of the stone—as much so, perhaps, as wood is less lasting than stone. They can obviously only be of value whilst they last, and their existence is but ephemeral.

Besides, in selecting the oils, it should be remembered that there are two classes—one distinguished as *drying*, the other as *non-drying;* and it is the former which are of the greatest value. These drying-oils (oil of turpentine and linseed-oil are common examples), on exposure to the air, absorb oxygen, and are converted into resins, which are more durable, and form a more impervious coating than the oils themselves.

And here I would draw attention to a remark made by Mr. Smith respecting the similarity in ultimate composition of the fats, fixed and volatile oils, alcohol, and ether. He classed these bodies in one table, showing their percentage of carbon, hydrogen, and oxygen, and drew the inference that, in consequence of their similarity in ultimate composition, and their common vegetable origin, they differed but little in their nature and constitution from each other. It is true that they may "possess a mutual good feeling for each other's company," and that Mr. Smith, by the aid of his "cauldron," might succeed in making a "hotch-potch" of them; but this does not prove any close similarity in their nature or real composition. The only respect in which they have any resemblance is in their having a vegetable origin, and containing carbon, hydrogen, and oxygen. But I would remind him that there exist many thousands of organic compounds of vegetable origin, which manifest the most opposite chemical properties—some being acids, some alkalies, some neutral bodies, some soluble in water, and some insoluble; some sweet, some sour, some bitter; some having the most delightful of perfumes, and some the vilest of odours—and yet they all contain but carbon, hydrogen, and oxygen.

Again: it does not follow that, because two bodies consist of carbon, hydrogen, and oxygen, *even in the same proportion*, they are identical, or even closely resemble each other; for it not unfrequently happens that bodies which, when submitted to ultimate analysis, are found to contain carbon, hydrogen, and oxygen, in exactly the same percentage proportion, are nevertheless strikingly different bodies, possessing the most discordant properties—probably from the elements being arranged in a different way—containing, in fact, the same ultimate elements, but different proximate constituents.

For example: common alcohol and the ether of wood spirit have exactly the same percentage composition, viz.:—

Carbon	52·17
Hydrogen	13·03
Oxygen	34·80
	100·00

Nevertheless their properties are very different, the one being an alcohol, and the other an ether—the latter being an inflammable gas at temperatures at which the other remains perfectly liquid.

Again: no one would confound the unpleasantly strong-smelling oil of turpentine with the essence of lemons, or otto of roses; yet they all three have the same per centage composition. Or, to take an illustration from among the organic salts (or ethers), some, though having the same ultimate composition, yet contain different acids and bases—*e.g.*, $C_6 H_6 O_4$ is the simplest representation of two bodies which widely differ from one another—viz., the formiate of oxide of ethyle $C_4 H_5 O + C_2 HO_3$; and the acetate of oxide of methyle $C_2 H_3 O + C_4 H_3 O_3$.

Hundreds of examples might be adduced, but, to apply these generalizations to the particular case, we have in Mr. Smith's table bodies of the most various nature, constitution and properties, classed together, and said to resemble each other most intimately;—there are ether and alcohol, which are types of two distinct classes of bodies in organic chemistry, and which, if alone applied to a stone, would in a few days evaporate, and leave not a trace behind: they are only useful for dissolving resins and some oils. Then we have resins—a class of bodies soluble in alcohol, ether, and some oils (as turpentine), and which dry to a hard crust. Then volatile oils, which oxidise to resins, and are soluble in alcohol. Then fixed oils and fats, which do not dry to resins, and are insoluble in alcohol. And lastly, caoutchouc, pitch, tar, &c., which are themselves the most complicated mixtures of oils, volatile and fixed, with resins, gum, &c., moreover varying in composition and properties to the most extraordinary extent.

So that the compounders of mixtures for preserving stone must not imagine that, because these bodies so closely resemble one another in their ultimate elementary composition, they are necessarily identical, or even very similar in real nature and properties.

I might also explain the reason of the numbers in the table all amounting to 100, which is so enigmatical to Mr. Smith; but it would lead too far into chemical details.

To return to the subject under discussion, viz. the processes for the preservation of stone.

It has been already mentioned that all the methods which consist in coating the stone with organic mixtures, composed of oils, resins, fats, &c. though more or less valuable, are but temporary expedients compared with others to be subsequently mentioned.

Under this first class may be included those of "The Indurated Stone Company" (François Teychenne), and of "The London Stone Hardening and Preserving Company" (Mr. Barrett); Mr. Henry Clinton Page's Patent; and lastly, Mr. John Benjamin Daines'.

Having recently seen the trials of Mr. Daines' process at the Houses of Parliament, I may be allowed to make a few remarks specially in reference to it. It differs in no essential respect from the others of the same class, consisting essentially in coating the stone with linseed-oil, to enable it to resist the action of moisture. The only variation from the others is in treating the stone with a solution of sulphate of zinc or of alum, previously to applying the oil, and also in dissolving in the oil sulphur or liver of sulphur. I am at a loss to understand what advantage is sought by this modification, and in what the superiority of this over any of the other processes for coating the stone with a layer of oily or resinous matter consists, or, indeed, why it is preferable to paint, especially if zinc, instead of lead, colours be used. But it certainly has many serious disadvantages; for in the first place, the action of the sulphur, whether in the free state or as liver of sulphur, upon either the impurities in the sulphate of zinc applied, or on the iron in the stone, produces a black sulphide, which gradually darkens the colour of the stone, and will doubtless soon render it almost black; a result certainly anything but desirable in London, where the atmosphere generally performs this office but too rapidly. Secondly, it is rather a dangerous experiment to introduce into the stone an element like sulphur, which, by oxidation, is gradually converted into sulphurous and sulphuric acids,—the very acids which, as products of the combustion of coal, render the atmosphere of London and other large towns so much more injurious to stone than that of the open country: it is, in fact, sowing within the stone the prolific seeds of its destruction.

The second class into which I have divided the various processes, embraces those the object of which is, either to convert the surface of the stone itself into a chemical compound less readily affected by an aqueous solution of carbonic acid (rain-water), than the original stone, or to deposit a less destructible chemical compound in or upon it.

The first suggestion of this kind, and, I believe, after all the most valuable, is that made by Professor Fuchs, of Munich, for the preservation of frescoe paintings, and successfully applied by Kaulbach (of which an example exists in the Museum of Practical Geology). It was subsequently employed for the preservation of ordinary stone erections by M. Kuhlmann, of Paris.* It consists in washing the stone surface after erection with a solution of silicate of soda (NaO, SO_3); but, in order that the process may be successful, its mode of action should be understood, and all the necessary precautions should be adopted in carrying it out. When the solution of silicate of soda (NaO, SiO_3) is applied to a limestone (CaO, CO_2), a double decomposition takes place, silicate of lime (CaO, SiO_3) and carbonate of soda (NaO, CO_2) are formed: that this is really its mode of action, I have satisfied myself by experiments made on pieces of stone treated in this manner by my friend, Mr. Henry Burnell. The establishment of this fact is one of considerable importance, as affecting the theory of its action, as it proves that we convert the carbonate of lime, which is so readily acted upon by an aqueous solution of carbonic acid, into one of the most insoluble of mineral bodies—the silicate of lime—one, moreover, which is scarcely, if at all, affected by carbonic acid, and this without in the least degree injuring the structure of the surface.

It is true that at the same time another action goes on, carbonic acid is capable of decomposing silicate of soda, as I mentioned when speaking of the disintegration of granite, and by this means free silica is likewise deposited on the surface, and in the pores of the stones; this silica, thus deposited, is more or less insoluble, but by prolonged exposure its solubility increases; still it is never all absolutely insoluble, and it appears to me that the great value of the silicate of soda arises from the formation of the silicate of lime from the very lime of which the stone itself is composed.

But as I said, certain precautions must be carefully attended to in its application; the secondary product, the carbonate of soda, which separates in the form of a saline efflorescence, must be carefully removed by washing from time to time, if sufficient rain does not fall to effect this result; moreover, it must not be imagined that one coating is sufficient—it should be repeated two or three times at intervals of several months, and the washings performed frequently during the intermediate periods; for this conversion of the carbonate of lime into silicate, and the removal of the soluble carbonate of potash takes place but gradually, and unless it be at first effectually performed it is useless; but if it be thus carefully carried out, judging on general principles, as well as from experiments, which I have carefully watched, carried out by Mr. Henry Burnell, at Chelsea, I cannot but feel convinced that the process is likely to prove most valuable. I cannot, however, too strongly recommend that experimental trials should be made with the necessary care by persons who are both unprejudiced, and, from their understanding the principles of its mode of action, competent to decide upon its merits.

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* See "Memoire sur l'Application des Silicates Alcalines Solubles au durecissement des Pierres Calcaires Poreuses." Paris. 1855.

I would merely ask Mr. Smith whether the single experiment to which he alluded in his paper, of which the results were exhibited to the meeting, (to which experiment reference was made almost in the same words by the Rev. Mr. Barlow nearly two years ago,) whether it was performed with all that care, and whether all those precautions were adopted, which are necessary to enable him to come to a fair decision on the merits of the process? I could point out to him spots on the Church of St. Luke, Chelsea, which have under treatment with the silicate become so hard that one can scarcely scratch them with a walking-stick, whilst the stone close by the side of it crumbles to powder under the pressure of the thumb-nail.

There are two other processes to which I must briefly allude, viz., Mr. Ransome's and Mr. Smith's own novel suggestion.

Mr. Ransome's process consists in treating the surface of the stone first with a solution of silicate of potash or soda, and then with a solution of chloride of barium or chloride of calcium, by which means an insoluble silicate of baryta or lime is deposited in the pores of the stone. This process if judiciously carried out is undoubtedly likely to prove valuable, but *a priori* reasoning would certainly lead us to give the preference to the use of the silicate of potash alone, and subsequent washing with water, for the following reasons:—

If the action of the silicate consisted merely in the deposition of silica in the pores of the stone, as imagined by some, then undoubtedly Mr. Ransome's method would be not merely similar in mode of action to, but perhaps superior to, the use of the simple silicate; but I have before shown that the silicate converts the very substance of the stone itself into a hard insoluble mineral compound, the silicate of lime, and it is on this account that I am inclined to anticipate more favourable results from it than from Mr. Ransome's.

Moreover, the silicates of baryta and lime, which are deposited by Mr. Ransome's method in the stone, will, I fear, be in a finely-divided pulverulent state, and in that condition afford but slight protection to the subjacent carbonate; unless it be that the gelatinous silica deposited simultaneously from the silicate of soda by the action of the air serves as a binding material, uniting the whole into a compact surface; experience alone can decide this point, and I would strongly recommend Mr. Ransome's process, as second to none but the simple silicatisation, to the impartial judgment of those who are willing to give these two processes those careful experimental trials which their intrinsic merits so well deserve.

Mr. Smith's own suggestion, notwithstanding its ingenuity, is, I fear, not likely to afford very satisfactory results. He proposes to imitate those natural processes by which carbonate of lime is deposited in a compact form, as in stalactites, tufas, and other native encrustations; but how is this to be carried out on a building? In nature, the surface which becomes coated with carbonate of lime, remains for months or years constantly exposed to the action of water saturated with bicarbonate of lime, and the very compactness of the mass arises from the extreme slowness of its formation. But how are we to imitate artificially such a process with success? Could we submit the wall of a building to the action of a constant but uniform current of a saturated solution of bicarbonate lime for years? In the first place, what would be the expense of transporting a calcareous spring, or of forming one artificially? and then, by what mechanical appliances could it be made to flow for years together over the surface to be coated? In fact, to produce a covering of compact massive carbonate of lime is impracticable, and if it be deposited quickly, it would be no better than the well-known process of white-washing. Indeed, even if it were possible to veneer a stone with compact carbonate of lime, it would be only equivalent to the choice originally of a good compact stone; for it would be still liable to the same destructive action of water and carbonic acid, as all other varieties of carbonate of lime, though somewhat more slowly; whilst the effect of the silicate of soda is to convert the stone superficially into silicate of lime, a mineral almost entirely unaffected by these agencies.

In conclusion, allow me to observe, that while it is the duty of the architect to select the best possible stone, it must not be forgotten, that even the best will always be liable to the same process of decay, the difference being rather one of degree than of kind, and therefore, if processes are from time to time suggested for protecting stone from this decay, it would appear both the duty and the interest of the architect to give them a fair trial.

Moreover, it can hardly be true that the *necessity* for preserving our buildings from premature decay is entirely an evil of modern date, for carbonate of lime must always have possessed the properties which it now has, and have been subject to the same kind of decay; but the fact is, that it is only in modern times that the attention of scientific, as well as practical men, has been directed to the discovery of processes for preventing that decay to which all building materials have been liable from the earliest epochs, and will continue subject, to the end of time.

The Hon. Secretary read portions of a communication from MR. WILLIAM HUTCHISON, of the Indurated Stone Works, Tunbridge Wells.

I continue to indurate the soft sand-stone of Tunbridge Wells for all engineering and building purposes. The stone is worked in its soft state to the desired form, however plain or elaborate, then dessicated prior to its induration; and this latter easy and simple process in a few hours renders it quite impervious to destructive weathering influence, also exceedingly hard and compact, susceptible of a brilliant transparent polish, and of every desired colour. It is also susceptible of silver and gold electroplating, or of any other metal, giving it the rich appearance of solid metal. Blocks of the largest dimensions, and any quantity, can be worked, dessicated, and indurated, as fast as required, either at the Indurating Works, or at the building in progress of construction.

My processes effect the same results on Portland, Anston, Bath, Caen, and other stones, or on any other absorbent material; but why indurate them, when soft sand-stone is preferable for cheapness, in sawing, working, drying, and indurating, and is, in fact, rendered indestructible from weathering influence, for all building purposes? Indurated sand-stone can be supplied at one-third less than the cost of Portland stone, &c.

Our expensive public statues in bronze, when first erected, are as bright as new coin, but in a few weeks, become black, dingy, and almost unrecognisable; whereas, if executed in soft stone, and then indurated by my processes, they would resist the destructive atmospheric influence, and become of a permanent milk white colour.

As to the application of any patent liquid to buildings already erected, I can practically prove it to be utterly ineffectual; but houses constructed of indurated stone exclude fœtid damp, vermin, and all possibility of malaria being retained in the walls.

Indurated sand-stone resists the pressure of the hydraulic machine, 540 tons having no effect on the cubic foot. Buildings constructed of it do not require battening, lath and plastering, as the stone walls are internally even, ready for colouring, papering, and painting; and as fast as each compartment is constructed it may be occupied.

All stone used for building readily yields to the action of fire, either by calcination or otherwise; but soft stone, if indurated with inflammable materials, resists better than any other, from its pores being filled up; and where there is no air, there can be no combustion.

I have been several times honoured as the inventor of this process, whilst I am only the humble improver. The inventor was Mr. Le Goux, through accidently dropping some gas-tar on Caen stone, which gave rise to his studying the means of indurating it.

A Communication was read from Mr. Frederick Ransome.

Having been led to consider the importance of preserving the stonework of our public and private edifices from the decay resulting from the variable condition of our climate and other causes, I directed my attention to the existing processes proposed for effecting such an object; and more especially to that which has been for some time in use on the continent, in which a soluble silicate is employed; and I found that this process, though having for its base so important and indestructible a mineral as silica, was nevertheless very imperfect in its results.

It appeared to me that one great cause of failure arose from the fact that the silicate, being applied in a soluble form, was liable to be removed from the surface by rain, or even the humidity of the atmosphere, before the alkali in the silicate could absorb sufficient carbonic acid to precipitate the silica in an insoluble form.

But another great and serious defect in this process still existed—viz., that even were it possible to effect the precipitation of the silica, still it would be simply in the form of an impalpable powder possessing no cohesive properties in itself, and therefore able to afford but little, if any, real protection to the stone. It seemed to me, therefore, necessary not only to adopt a process which should insure an insoluble precipitate being produced, independently of the partial and uncertain action of the atmosphere, but that, to render such a means efficient, a much more tenacious substance than merely precipitated silica must be introduced; and in the course of my experiments I discovered that, by the application of a second solution, composed of chloride of calcium, a silicate of lime would be produced, possessing the strongest cohesive properties, and perfectly indestructible by atmospheric influences.

The mode of operation is simply this: the stone, or other material of which a building may be composed, should be first cleaned by the removal of any extraneous matter on the surface, and then brushed over with a solution of silicate of soda or potash (the specific gravity of which may be raised to suit the nature of the stone or other material); this should be followed by a solution of chloride of calcium, applied also with a brush; the lime immediately combines with the silica, forming silicate of lime in the pores of the stone; whilst the chlorine combines with the soda, forming chloride of sodium or common salt, which is removed at once by an excess of water.

From the foregoing description it will be apparent that this invention has not only rendered the operation totally independent of any condition of the atmosphere in completing the process, but the work executed is unaffected by any weather, even the most excessive rains. Experience has shown that where once applied to the stone it is impossible to remove it, unless with the surface of the stone itself.

I do not confine myself solely to the solutions above referred to; in some cases I prefer to use, first a solution of sulphate of alumina, and then a solution of caustic baryta, when a precipitate of sulphate of baryta and alumina is formed; the main object being to obtain by two or more solutions (which upon being brought into contact mutually decompose each other and produce) an indestructible mineral precipitate in the structure and upon the surface of the stone.

The following extracts from a Communication by Mr. John Benjamin Daines were read:—

Mr. Smith, in his paper read here in December last, entirely forgets one grand cause of the decomposition of buildings in our large towns,—I refer to the gases formed in our sewers and manufactories, and dispersed into the surrounding atmosphere, and more especially that caused by the burning of coals in all our dwellings. In London there are somewhere about 340,000 houses, which daily burn coals, containing at least one per cent. of sulphur, which is consequently sent forth in the form of sulphurous acid gas, the peculiar property of which is to attack and destroy building materials composed of either carbonate of lime or magnesia.

If I am rightly informed, Mr. Smith's experience must prove to him of how little use it is to select stone (so far as durability is concerned) for the erection of our metropolitan buildings. Bridgewater House, completed less than ten years ago, is now in a worse state of decay than any edifice in London erected for a similar period, and yet Mr. Smith himself was appointed to see that none but the best stone was used, and doubtless he did select the best; but the atmosphere of London is now very different from what it was at the time of the erection of St. Paul's Cathedral and Greenwich Hospital.

With regard to these two buildings (notwithstanding Mr. Smith's implied opinion), I find that portions *are much decomposed;* and I noticed in one place, on the body of the latter, that nearly an inch in depth had been separated from the original face of the stone. The surfaces which have become covered with depositions of soot and dirt are protected to a great extent; but the parts that are kept clean by the prevailing winds are suffering considerable decomposition.

Whatever care may be bestowed on the selection of the material, all stone buildings, in large towns especially, will be liable to premature decay; and in many instances, where they are erected of good stone, and rapidly decay, I believe we may look for causes belonging to the locality. In making these remarks, I of course exclude the granites.

Of late years many plans have been proposed for the preservation of stone; but, from not fulfilling the conditions necessary for the purpose, they have failed; indeed, had the change desired to be produced by some been effected, the result would have been the entire destruction of the stone to which the inventions were applied.

Warned by these failures, and taught by my own experiments during a number of years, I was led to look in another direction for the means of attaining the object. Having observed that linseed oil has the property of becoming exceedingly hard, from the absorption of oxygen, when applied alone, as on furniture, or when mixed with oxide of lead, as in paint, I was led to infer that, if I could discover some substance that would dissolve in linseed oil, be unalterable by the action of the atmosphere, and not interfere with the colour or composition of the stone, I should obtain the long sought for desideratum. This I have accomplished by dissolving sulphur in certain proportions, and at a certain temperature, in purified linseed oil.

My process consists in dissolving one part, by weight, of sublimed sulphur in eight parts of linseed oil, by putting them together in an earthen vessel, and raising the temperature to between 226° and 278°. This solution, when cold, is laid upon the surface of the stone buildings by means of a brush. The advantages of this process are numerous; among them I may mention, the great ease with which it is applied; the preservation of the normal appearance of the stone, and the rendering it quite impervious to damp and air, the two great distroyers we are seeking to oppose. Buildings protected by its use are always free from depositions of soot and dirt, (which so much destroy the beauty of those erected in our large towns) and once treated with this composition, the process will not (like paint) require to be repeated.

That my composition is one of those substances which act merely mechanically is perfectly correct; but what does Mr. Smith want more? it answers the purpose for which it is intended. If we could form artificial in the interstices of the natural stone, we should no longer require the services of the quarrymen; we should prepare our blocks on the spot and of the dimensions required. Mr. Smith proposes, and Mr. Ransome appears to support him, in making it a matter of necessity, that a chemical change should be effected in the stone or other material operated upon with a view to its induration. Experience compels me to differ from those gentlemen. And I am convinced that to effect the object intended by the various methods now under consideration, it is a neutral mechanical, and not merely a purely chemical medium which must be employed as a universal panacea, if no reference is to be had to the constituents of the various stones to be operated upon; for instance, a certain chemical combination might answer admirably upon a sandstone, or a stone composed almost entirely of carbonate of lime, whereas, the application of the same mixture to a magnesian limestone would produce a very unsatisfactory result.

All chemists agree that sulphur, the substance used by me to give body to the linseed oil, is unalterable in the air, and unacted upon by moisture; if there is any change, it rather improves the colour of the stone to which it is applied, as is shown by the experiments in Old Palace Yard, adjoining Victora Tower, the statue of Captain Coram at the Foundling Hospital, and other places. It has been proposed to wait eight or ten years before applying anything to prevent the stonework of the Houses of Parliament from decaying. Any person may judge of the wisdom of such a proposition by picturing to himself its probable state at the end of that period, if it goes on perishing at its present rate. I have no doubt but that the stone was the best that could be selected in the absence of the test of the London atmosphere. All that science, research, and experience could suggest was brought to bear upon the question; and it now remains that one more step shall be taken—viz., to use the best means that can be devised to preserve the magnificent structure.

Mr. Clarke, Visitor, observed that some time ago, Mr. Rochas brought forward a process which was essentially the same as that of Mr. Ransome. He (Mr. Clarke) had not carried out his experiments so far as he could wish, but he had investigated that process, and it appeared to him that the only action of the silicate of potash on the stone was mechanical in filling up the pores, and so preventing the action of air and moisture; and that no chemical change took place from subjecting carbonate of lime to the action of silicate of potash.

Mr. Page described a process of induration he had adopted for upwards of twenty years, which consisted in the application of a solution of potash and lime, and afterwards of bees'-wax, introduced by means of turpentine, naptha, and other fluids. The mixture was applied with a brush, and the process was as easy as white-washing. He produced a number of specimens, showing by the stains in the stone, that this preparation could be made to penetrate to from one-eighth to two inches, and even to completely saturate the stone. He had applied it to upwards of 400 works in Birmingham, Wolverhampton, Bilston, Liverpool, and other places in the Midland Counties, and on examining those works in the course of last winter, he found that where the stone had only had one coating, it had stood as well as where a dozen coats had been applied.*

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* A Communication from Mr. Page states that bees'-wax is the main ingredient, in connection with potash and lime, in his patent. It is known that nearly all oily, greasy, and resinous substances do indurate to a certain extent; but the true character of bees'-wax is not so much known as it ought to be. Forty years' experience in making up nearly all these substances into different cements, has shown him that bees'-wax is the only one which can be relied on to stand for a great number of years. Twenty years ago he began to apply different gummy and resinous solutions to the face of monumental

The Rev. Mr. Owen said, that he had attended the meeting to bear testimony to the fact that Bath stone and marble, treated by Mr. Page's process had, to his personal knowledge, successfully withstood the effects of a very smoky atmospere for sixteen or seventeen years. In the churchyard of St. Mary, Bilston, might be seen a monument, in which the front of the stone had been thus treated, and the back left unprepared, and whilst the former was in a state of rottenness, and falling away in every direction, the front was perfectly sound, and the inscription upon it perfectly distinct and clear.

Mr. Barnabas Barrett described his process as consisting of the application of a solution of sulphur, after the stone had been placed in an exhausting chamber so as to produce a vacuum. A different mode of treatment was necessary in different cases. Thus, at Holland House, where the stone was so dilapidated that it would hardly bear the application of the brush, he had first applied the solution of sulphur, and afterwards a mixture of resin, oil, and shellac, which was laid on hot, with a brush, and which became as hard as the stone itself. The cost of his process was about one penny per superficial foot. Mr. Barrett exhibited specimens of stone and chalk, induratad by his process; the latter of which he stated had become as hard as granite. It was not necessary to clean off the injured face of the stone before applying the solution; thus the original appearance of the work had been carefully preserved at Holland House.

Mr. G. R. Burnell, C.E., said, it appeared to him that the present discussion had taken a rather unpractical turn. The durability of the monuments of Nineveh, as contrasted with those of our country, was due to the difference of climate. The failure in the Caen stone employed at Buckingham Palace and elsewhere might have been foreseen; as that material was utterly unfit to be employed in any situation where water could lodge upon it, or be taken into it by capillary attraction, such as the upper parts of cornices, window cills, plinths, &c. Mr. Ashpitel had alluded in the previous discussion to the precaution adopted by Sir C. Wren, of exposing the blocks of stone required for St. Paul's Cathedral, upon the sea-shore, for three years before they were employed in the building. It was evident that during such a period some kind of chemical change must go on in the stone, and that the effects of the first winter would exhibit any inherent weakness in the stone. Of the various processes of induration which had been mentioned, some were mechanical and some chemical. He thought the application of any coating of oil or other matters objectionable, inasmuch as they were subject to a different action from temperature to what the stone itself sustained, and there was consequently a tendency in such superadded bodies to detach themselves from the stone. His own opinion was, that no system could permanently succeed, unless it acted chemically upon the stone, and converted it in to an insoluble material. The processes of Mr. Kuhlmann and Mr. Ransome professed to do this; but whilst each of them asserted that by his own process the silicate of potash converted the carbonate in the limestone into a silicate of lime, he contended that the process of the other merely resulted in depositing a powder in the interstices of the stone.

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work, in order to obtain a durable oil blacking without stain, and without the necessity for painting the letters singly with a brush. Finding, at length, that bees'-wax was the only article to be depended on, he adopted it, and subsequently discovered, accidentally, on holding a piece of marble to the light, that the solution had penetrated a quarter of an inch, to which depth the marble was impervious. Mr. Smith, in his paper, states that oils and greasy substances lose their protective or unctuous consistency in a few years, and what little is left is the stearine or solid wax. The application of Mr. Page's process is simple, either to the largest building or to the smallest specimen; but small works can be done by means of a slight wax-melting heat, which saves the expense of the fluid; while, for out-door work, the fluid must be used, one coat of which, properly applied, would be sufficient, and would cost about as much as painting; but, should it be thought necessary to ensure a deeper saturation—say to the extent of half an inch—more coats would have to be laid on, and the expense would be proportionally increased. The time-coloured surface of an old building would not be disturbed, only washing it with a slight application of acid and alkali being requisite, to clean it before laying on the wax solution.

Whilst the doctors thus disagreed, it appeared most desirable that a proper and official investigation should take place by a competent committee, whose report would be far more satisfactory to the public than any description of particular patents by the inventors themselves, or any such general discussion as could take place at a meeting of the Institute.

Mr. **Dines**, Visitor, said, that with regard to Buckingham Palace Mr. Cubitt had not chosen the stone employed. He never liked the stone, nor had he ever used it elsewhere; but when its adoption was decided upon by others, he used every precaution to get good stone, and took every care in selecting it. It should also be remembered that at the time in question the properties of Caen stone were not so well understood as the labours of Mr. Donaldson and Mr. Godwin had since made them.

Professor **Tennant** concurred in many of the remarks of Mr. Smith and Mr. Witt, but believed they had not sufficiently considered the nature of the different materials employed for building purposes. He considered it a matter of regret that builders should continue, from the force of habit only, to employ the same material again and again, although better stone might be obtained at less cost, and within a much less distance. Moreover, there were many valuable building stones which had been almost entirely neglected by modern architects and engineers; amongst them, the syenites, the elvans, and a large proportion of the granites, as well as the different varieties of flint, and the quartz rocks. This neglect was the more remarkable now that the increase of railway communication so greatly facilitated the conveyance of building stones. He had seen a church lately erected with an inferior kind of stone, brought from a considerable distance, and which did not appear to him likely to last more than a hundred years; whilst the material, to be had within a distance of a few hundred yards in the mere rubbish of the rocks (used only for repairing the roads) would have built a church which would have stood a thousand years at least. Professor Tennant sketched upon the board the composition of the oolite formation, and made some remarks upon the effect of solutions injected into it from the surface.

Mr. **Whichcord**, Fellow, observed that the syenites and flints referred to by Professor Tennant, were so extremely hard, as not to be available for the ordinary purposes of builders, who would otherwise be glad to use them. The great object of the present discussion was to ascertain how far soft stones could be made durable, within a reasonable limit of cost. Many of the suggestions offered were of great value, but a report from the Institute at large, or from a committee, would be exceedingly desirable.

Mr. **Witt** added some further remarks of a scientific nature in reference to the supposed formation of silicate of lime by the process of Mr. Rochas, in a pulverulent state, and stated that it is deposited in a gelatinous form.

Mr. **Ransome** stated that he differed from those who considered that silicate of lime was formed by the application of a solution of silica to stones composed of carbonate of lime. He had strong reasons for believing that there was no perceptible combination between the lime and the silica, but simply that silica was produced in the form of a powder. By the addition, however, of a second solution of chloride of calcium, a different material was formed in the stone, which possessed great density in itself, and a degree of hardness amounting almost to indestructibility, so far as the effect of the atmosphere was concerned. It should not be forgotten that in addition to limestones, other building materials, such as silicious stones, and others, of a friable nature, required some process of a preservative character, and in those cases there could be no doubt that the application of a solution of glass could only produce a mere precipitate of silica.

Mr. C. H. **Smith**, Hon. Mem., in reply upon the discussion generally, expressed a wish that Mr. Witt had more carefully read the paper which had led to the discussion, as it appeared to him, that Mr. Witt had only referred to such parts of it as suited his own views. In submitting the table of materials consisting of the same chemical elements, he (Mr. Smith) had especially guarded himself by stating that a combination of the same proportions did not necessarily produce the same body; a statement which Mr. Witt had entirely misrepresented. He admitted the injurious effect of carbonic acid (which in its action, upon limestone especially, he had himself illustrated at the Institute,) but it was almost impossible to detect its influence at all in the atmosphere of the country, or at the top of St. Paul's Cathedral. It was certainly less than 1 per cent. (Mr. Witt.—Very far less, but most important, nevertheless.) Sir John Soane had been in the habit of constructing chimney caps of Portland stone, and although there was a quantity of carbonic acid from the fires, and a great deal of rain water, these chimney caps, when taken down, were found to be as perfect as any other part of the building. In like manner, the quantity of sulphuric acid in the atmosphere was scarcely appreciable in its effects. With regard to the silicatization of stone, he did not deny that it could be accomplished. He had only referred to cases in which it did not appear to have completely answered. This was inevitable in all new processes, and he believed the process in question was now succeeding better than at first. He admitted that he had been concerned in the selection of the stone for Bridgewater House, and under his orders eighty tons of that stone had been sent back, to the discredit of those who had sent it, because it was unfit for use; and if he (Mr. Smith) could have done as he pleased, he would have rejected it all.

Mr. H. H. Burnell, Associate, read a letter from M. Viollet le Duc, in reference to M. Rochas' method of silicatization:—"At Notre Dame, Paris, all the old decayed parts which have been thus treated, four, three, and two years ago, have acquired a hard surface, capable of entirely resisting atmospheric influences. Stones, in a crumbling state, and in which the daily decay was perceptible, have shown no signs of change since the treatment which has rendered their surfaces hard, close, imbibing no moisture, and consequently free from moss and lichens. The process that we have more particularly employed is that of Messrs. Rochas and Dalemagne—that adopted by Mr. Kuhlmann was not so effective. They apply the silicate by means of small pumps, which causes the fluid to enter further into the stone. Success in these operations depends much upon the nature of the limestones, those of Paris being dry and porous are particularly disposed to absorb the solution, as are also those found in the department of the Oise. Rich limestones are much more difficult of treatment. At the Cathedral of Amiens I have also succeeded in silicating the chalk of which this monument is composed. From the above, it must not be understood that this process can be at all times employed: on the contrary, it is only with those that have the qualities I have named that it can be attended with success. The silicating should be done in fine weather, when the stone is free from humidity, and after the application the stone should be well washed with water to remove the surplus potass. It is certain that complete success has attended that done at Notre Dame, Paris, and at Amiens Cathedral. At Havre, also, I have been successful in some experiments." This process, Mr. Burnell stated, had been very largely used in Paris, especially at the Louvre, &c. The English patent had expired, and he strongly urged all who were interested in the matter to examine carefully the works now in progress in Paris.

The Chairman, Mr. Godwin, Fellow, called upon the members to express their thanks to the gentlemen who had afforded such valuable information, and for the good temper and courtesy with which the different inventors had brought their statements before the meeting. It could not be doubted that good would result from such a discussion; and although it was somewhat distressing to architects to find themselves embarrassed by conflicting opinions, they were justified in hoping that with the assistance they had had on this occasion, they might soon arrive at a clear opinion on the comparative merits of the different processes which had been brought before them.

The meeting then adjourned.

REPORT of the Committee, appointed by the Council of the ROYAL INSTITUTE OF BRITISH ARCHITECTS to examine the SOULAGES COLLECTION, and report their opinion, whether it would be expedient to recommend its purchase by the Government; read at the Ordinary General Meeting, February 9th, 1857.

YOUR Committee have to report that, pursuant to your instructions, they have attended twice at Marlborough House, and have also at various periods individually inspected the Soulages Collection, and compared the specimens contained in it with those derived from the sale of the late Mr. Bernal's effects, and other sources. They have experienced the utmost attention on the part of the authorities and officers of the Department of Science and Art, who furnished them with copies of the admirable report drawn up by Mr. Robinson,* and afforded them every facility of access. Before entering upon any criticism of the collection itself, your Committee think it desirable to allude briefly to the influences, which such a collection may have upon the tastes and studies of the architect, and to the share, which architecture, as the controlling spirit of decoration and ornament, has had in eliciting productions in which art and industry are harmoniously combined. For the illustration of such questions, the collection now under notice, containing specimens, ranging generally between the Fifteenth and Seventeenth Centuries, of elaborate works in almost every material applicable to domestic use or embellishment, offers subjects of rare importance, meriting the most serious consideration of all, who would fain anticipate for this country an advance in the arts of design coincident with the great strides, which have been made of late years in science and material prosperity.

SOULAGES COLLECTION.

The enlarged views in regard to Architectural Decoration, which have recently revived the taste for ornamental design, that some centuries ago was so prevalent in England, render it necessary for the architect of the present day to enter upon new fields of study; to seek for new sources of inspiration; and to acquaint himself with all the formulas of conception to be found in the productions of other branches of science and art than those which are directly structural, in order to qualify himself to take that lead in directing public taste, which his position and vocation call upon him to assume. It is indisputable, that in every age the sources of design for all classes of manufacture have been identified with the productions of the architect, and frequently derived from his conceptions. Among the ancients the fictile vases and the bronzes may be quoted in illustration of this fact, as constantly borrowing their ornaments from the buildings of antiquity; and in the Mediæval period, the pillars, the buttresses, the carving, the panelling and architectural divisions, all of which were applied to *fittings* of every description, were adopted from the structural details of the edifices, often with little or no reference to material, or other proprieties of adaptation.

As the Architect's development of the artistic element is the highest applicable to the common purposes of life, it is obvious, that the revival of obsolete sources of decoration demands the utmost circumspection. To acquit himself conscientiously of such a responsibility, he must neglect no means of information—he must underrate no style, no object, no department, which may contribute to those harmonious effects, which it is his province to endeavour on all occasions to ensure. He must enter upon a new career of thought, and acquaint himself with the history and fluctuations that have distinguished each phase of the origin, development, and decay of every class of applied ornament: so as to adapt it with propriety, taste, and originality, as an ever fresh idea, and not as a mere "rifacciamento" of existing forms.

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* The instructive notes and observations appended to each class of objects, introduce the reader at once into a brief history and analysis of each division. It is impossible to over estimate the additional instruction, which the publication of such Catalogues confers upon the casual visitor of Museums and Collections in any way analogous to the Soulages.

Collections, like those of M. Soulages and of the late Mr. Bernal, are of the utmost value to the Architect, reflecting as they do the arts, manufacture, skill and taste of various countries and periods; and shewing their application to the ordinary uses of life in the several grades of society. No less remarkable are they, when set in contrast with the industrial practice of the first quarter of the present century, a period of singular barrenness in technical design, since they serve to bear only a more vivid testimony to the extent to which art was applied in the most trifling and ordinary utensils and objects, during those palmy days of Italian grandeur, when were executed the majority of the specimens of which those collections consist. During such periods the sentiment of art would appear to have been absolutely necessary to commend the productions of the skilled mechanic to general acceptance. And it is remarkable to observe that taste never became the exclusive property of any one department or class of productions, but reigned an universal element; the decline of purity in any manufacture, being but the sign of a general and concurrent deterioration in every other. Such Collections represent a world wide school, in which to form an universal rather than a particular standard of National taste; and thus the student is freed from the trammels of that confined view of style, which the traditions of any one period, limited within a narrow geographical circle, would bind around him. France, Italy, Germany and England have furnished their quota of excellence in many ways to the specimens now brought together in Marlborough House; and from the very distinctive peculiarities, which characterize the various productions, a wider field is afforded for the wares of the manufacturer of the present day, fresh tastes are excited, and an earnest longing is created in the purchaser for the possession of more refined and excellent productions; raising them above mere mechanical results, enlarging their sphere of application and necessarily stimulating production.

There can be little healthy progress in National manufacture, so long as the commonest and mere material wants only have to be satisfied; but directly cultivated taste seeks for superior execution and more refined elegance, enterprise and skill are enlisted in the gratification of those tendencies, progressive improvements constantly arise, industry and commerce gain by the movement, and the material prosperity of those engaged therein necessarily follows.

ENAMELS.

There are many arts, which once flourished in this country, and which have been applied only in a very limited manner within a century or two, while there are others, which have never received in Great Britain the development of which they are capable, and which in other countries have been productive of very important results. Enamelling was at one time extensively used in England, as we may see on the metallic monuments in Westminster Abbey, some of the recumbent figures of which were covered with elaborate ornaments of this nature, as also the Heraldic Shields occasionally inserted in brasses. It is now almost entirely confined to smaller works of the jeweller's craft, or elaborate reproductions of choice pictures and portraits: whereas in the Bernal and Soulages Collections are to be found medallions, and plates of considerable dimensions, and the art applied to tazze, inkstands and salt cellars, enriched with most delicate arabesques and historical subjects. Such specimens give renewed hope that we may ultimately realize, at moderate cost, the process of enamelling on slabs of lava, brought under the attention of this Institute some years since by our Honorary and Corresponding Member, Mons. Hittorff, now President of the section of Fine Arts of the Institute of France, or medallion portraits of a nature somewhat similar to those introduced in the façade of the Academie des Beaux Arts at Paris, by Mons. Duban. There seems no reason, if public taste afforded the encouragement, why enamelled panels might not be successfully introduced as an architectural decoration, durable as to material, brilliant in color, and unchangeable in effect. A notable instance of such an application of enamel existed in the famous Chateau de Madrid in the Bois de Boulogne, Paris, which has been the theme of praise by all writers who have mentioned it. The façade was adorned with enamels 5 ft. high by 3 ft. 4 in. wide, nine of which still exist in the Hotel de Cluny.* Were such panels capable of being multiplied at a moderate cost, we might from time to time introduce in our buildings a series of all but imperishable portraits of our sovereigns, of eminent men and historical characters; not as in past times confining the subjects of such enamels to the twelve Cæsars, the labours of Hercules, or such pedantic abstractions, but adopting themes from our own poets, writers and historians; and these would come more home to the feelings, and commemorate for popular honour and respect those celebrities, who have illustrated our own history and have rendered eminent services to our country.

MEDALS.

Medal die engraving is at present of very restricted application, being generally limited in this country to too small a class of objects; and little patronage is bestowed upon what was among the ancients, and after the revival, a most important department of art production. The medals and coinage of antiquity are upon a par with the productions of Phidias, Lysippus, and Praxiteles; and the coins of Sicily and many towns of Greece, the medals of Alexander and his successors, as well as the Roman Imperial series, reflect the genius of the brightest eras of antique taste and skill. Of scarcely inferior merit were the Italian medals: and the medallions of various sizes—whether cast or struck—of the fifteenth and sixteenth centuries, are full of intense meaning, handing down to us, with the utmost vigour and refinement of expression, the lineaments of the great, the noble, or the illustrious of those periods..

Of such gems, the Soulages collection contains 106 specimens, chiefly of Italian and French art, struck or cast, presenting many varieties of treatment, and suggestive of an useful application of such memorials in modern times, combining valuable æsthetic results with historical records of an almost imperishable nature.

GLASS.

The brilliant progress, which has been made in the manufacture of glass in this country within the few years, that have elapsed since the removal of those fiscal restrictions which arrested all improvement and threw this country behind others, invests the articles of this class in the Soulages collection with great interest. Without entering into the technical processes of the "laticinio," "vitro di trina," "millefiori," "aventurine," and "schmelze," some of which are already practised in England, we may at once confidently predict, that the study of choice specimens like those presented to view in Marlborough House will lead to the development of new combinations, which will some day distinguish our English manufacturers as much as, if not more than, their Italian or

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* It is said that some were purchased by Englishmen, and are now in this country. It would be a great service to the arts if they could be discovered, and exposed in the Great Exhibition about to be opened at Manchester.

Bohemian predecessors. The rapid advance in the scientific manufacture of glass, and the new applications of that material, which have recently been brought to light for the supply of architectural requirements, are alone sufficient to convince us, that this art is capable of the utmost development through English enterprise.

BRONZES.

The 106 objects in bronze, comprised in the Soulages Collection, illustrate a class of manufacture hitherto of very limited application in England; whereas, in her Eastern Dependencies, the artists in bronze for centuries past have produced, even in common utensils, elegance of form and unrivalled decoration in metallic inlay. This latter elegant process, which was of essentially Oriental origin, was eagerly adopted by the Venetians, and re-produced in their Damascened ware.

Tens of thousands of French artizans are maintained by their skilful treatment of bronze, now an essential article of furniture in that country, and purchased with avidity in England and indeed throughout Europe and America. So unpractised are our founders in the successful casting of such delicate objects, and so deficient are we in educated chasers and finishers, that we have to depend mainly on foreigners for the supply of small bronzes. Their production by English manufacturers is, indeed, so costly, that the Art Union of London (who for many years devoted much attention to the subject, and at great expense brought out various statuettes and busts), anxious as that body are to encourage the art, have been almost compelled to abandon the attempt to any great extent, and only persevere under the most discouraging circumstances. The beautiful works of art in bronze, so abundant in Paris, find no rivalry here. And we feel, therefore, that the acquisition of the specimens in this Collection, although far too limited for the urgent necessity that exists for the supply of good models in this branch of industry, would be desirable, as tending to draw public attention to this important and neglected branch of art manufacture. We do not venture to class them in design or execution, with the matchless productions of antiquity, such as those preserved in the Museum of the Studij at Naples—or even with modern ones of the highest class of art—but still there are many objects gracefully composed, elegant in form, and especially suggestive of improvement in those departments of domestic economy, into which they might be introduced with propriety.

DECORATIVE FURNITURE.

There are 100 pieces[*] of furniture and textile fabrics, consisting of chairs, cabinets, coffers, tables, buffets, dressoirs, metallic mirrors, a magnificent lanthorn, the cornice of a room, three pairs of bellows of tasteful design and execution, and an elaborate chimney-piece. These present a store of useful and applicable articles of various merit. Some few are carved with considerable skill, others are distinguished for their general design, or graceful proportions. Some have been considerably repaired or modified by inferior hands, but others remain intact. The buffets and armoires are suggestive, and admit of easy application to our present uses. The chestnut-wood coffers, the marriage-chests of Italian history and romance, have evidently originated in a superior class of artists, and the metal mirrors, with their carved frames, are graceful illustrations of a curious variety of domestic utensils. In all these articles it is necessary to discriminate between the production of the manufacturer who repeats, and the treatment of his material by the artist who originates. We may still be enabled to recognize clearly those forms and expressions of original ideas, vulgarized by the common taste of those who repeat, or demand repetition; for, although coarse in parts or gross in detail, they may still retain some of the elements of that antecedent period, when livelier imagination, more refinement, and truer sentiment prevailed. The textile fabrics contain some very elegant ornamental patterns, and several curious specimens of embroidery.

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[*] Artistic in general effect are 660, 670, 691, 698. Nos. 655, 656, are to be praised for their design and execution; and 670, 671, for exquisite design and workmanship.

MAJOLICA.

We have reserved for our concluding remarks the most numerous and most important section of this collection, namely, the Majolica, and enamelled earthen and stone wares, consisting of one hundred and sixty-eight pieces.* We shall not enlarge upon the mutual relations of art and material, nor upon the extent to which all branches of fine art are influenced by the materials employed. This is especially perceptible in the earthenwares of Greek art and Majolica, in contrast with the porcelains of Asia and Europe, and their works in this class are as distinct as the earths of which they are composed. Nor do we pretend to review the various processes of manufacture, nor the mysteries of the glaze and brilliant lustres, which give so much attraction to these admirable productions, such as the metallic reflexions, the changing colours, the mother-o'-pearl of Gubbio, Urbino, Pesaro, Caffagiolo, Faenza, Castel Durante, or of other Towns or States of Italy, where the enlightened patronage of the Dukes and Princes to these wares realised a reputation, that could hardly otherwise have been acquired by places of such secondary importance. The earlier pieces of Majolica retain much of the noble simplicity of form and richness of decoration of their Hispano-Moorish origin; and the later ones have a higher aim than the porcelains of Germany and France, whose art decorations occasionally present a fantastic and capricious application, and generally a minute and highly-wrought elaboration by superior artists, almost too precious for the frail material upon which it is bestowed, limiting the products to the tables only of the most affluent.

The Majolica on the contrary, admits, when once the design is settled, of a rapid execution by practised secondary hands; by this economy in the production most carefully designed objects may be brought within the means of the humbler admirer of art. This series includes some choice specimens† of Bernard de Palissy's skill, and embraces every class of object fitted for the table, or to adorn the buffet or dressoir; such as plateaus, plâques, vases, plates, fruttiere, tazze, trays, or baskets, cups, flasks, bowls, ewers, sauce-boats, salt-cellars, and other articles. The finest of these are grouped in one case, and constitute a series of the highest æsthetic value, as regards their form, the combinations of colour, and treatment of decoration. They are available as types, or may be considered educationally as specimens to be followed, improved, or varied—there is not one which is not valuable for the one or other purpose. The success may be problematical of any attempt to derange the predilections and established favour, with which the public have been accustomed to regard certain articles of use in common life; but we believe that the public mind is prepared and anxious to adopt a higher state of art-treatment in such objects.

Without advocating for a moment a blind adherence to any of these forms, or the modes of decoration, which distinguish these wares, in which occasionally the execution may not rise to the dignity of the subject—in which extravagance may now and then have usurped the place of good taste, and in which noble forms may be here and there applied to inferior uses—we may clearly recognise so much that is noble and brilliant,—so much that is full of feeling and expression, and such an appeal to a higher intelligence, as to warrant our maintaining distinctly, that access to such examples must improve the taste of the people, and elevate the aspirations of every mind for something better than those we already possess. This consummation we are indeed justified in prognosticating, (from the successful efforts in Majolica made by the firm of Minton for the Paris Universal Exhibition of 1855,) our own countrymen on the banks of the Trent and the Severn are fully able to attain. From those exertions we may reasonably contemplate that in a few years, by the teaching aid of such examples as those contained in the Soulages Collection, by the union of manufacturing skill in the manipulation with artistic power in the embellishment, and by due encouragement from the public, Majolica will become in this country a most attractive and very important branch of art production, and eventually compete with the ceramic works of any period and of any country.

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* Very satisfactory in point of design are the arabesques around Nos. 1, 2, 4, 5, 7*a*, 7*b*, 7*c*, 28, 29, 35*m*, 38, 38*r*, 41, 43, 15*k*, 15*h*, 15*l*, 66, 72, 75, 76; and in form as well as in decoration, 86, 88, 92, 105, 108, 110; and as works of real art, 3, 6, 8, 9, 82.

† Very high in style of conventional ornament, in design, execution and effect, are 138, 142, 143, 144.

In conclusion, we have to report that we are unable to contemplate, without the deepest regret, the possibility of such a collection being broken up and scattered into various channels. Each individual piece has its own peculiar value or merit: but when combined with others, as illustrating either the theory or history of art, so as to complete the chain and connexion of manufacture and art illustration, and thus forming a series of the progressive excellence to which such productions have been carried in times past, their worth is much enhanced. If Government were to rely upon the chances of a sale, they would probably be outbid for the best articles by wealthy individuals, who will gratify a taste at a fancy price, and thus the Museums of the nation would have in such an event only the chance of obtaining secondary articles, purchased at greatly enhanced cost.

In making this report, the Committee have deemed it more advisable to submit their opinions, based, after a careful examination of the objects, upon a broad and general consideration of their importance as a whole, and as a commencement and very desirable contribution, with the series obtained from the Bernal Collection, towards a large and complete historical and artistic museum, rather than upon a minute criticism of any individual specimens. And they have come to the conclusion, that it would be an irreparable loss of a great opportunity to improve our manufactures, to enlarge the sphere of art application, to increase our commerce, and instruct the public mind, if the Government did not accept the offer to sell the whole to the nation at cost price:—an offer so nobly made by the disinterested and public spirited men, who, with singular generosity, and on their own responsibility, have at all risks afforded the opportunity to the country of securing the collection in its entirety.

T. L. DONALDSON, Chairman.
S. ANGELL.
A. ASHPITEL.
TALBOT BURY.
BENJ. FERRY.
E. I'ANSON.

T. H. LEWIS.
A. SALVIN.
G. VULLIAMY.
T. H. WYATT.
C. C. NELSON, } Hon. Secs.
M. D. WYATT, }

January, 1857.

A BRIEF MEMOIR OF THE LATE ALEXIS DE CHATEAUNEUF, HON. AND COR. MEMBER.

By Charles Fowler, Jun., Associate.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, Feb. 9th, 1857.

Alexis de Chateauneuf was born 18th of February, 1799, at Hamburgh, where his father, one of the old French nobility, had taken shelter at the Revolution, and married. His only son, the subject of this memoir, after completing his school education, was, by his own desire, afforded an opportunity of learning the practical part of his future profession in the workshop of a builder, while he devoted his spare hours to the study of mathematics. In 1816 he acquired the rudiments under M. Wimmel, town architect, and in the following year went to Paris to pursue his studies at the Academy, but finding that he did not derive the advantages expected, he removed to Carlsruhe, where he applied himself assiduously for three years in the atélier of Oberbaurath Weinbrenner.

Having thus thoroughly grounded himself in the elementary knowledge of his art, he commenced, in 1821, a tour through the south of Germany and Austria to Italy; where he visited all the most important remains of antiquity, and devoted himself to their study, remaining in Rome above a whole year.

In 1823 he returned to his native city, and commenced his professional career by carrying out the town residences of Syndic Sieveking, and his brother, the Senator, besides minor works. He also spent much time at the neighbouring Hanse Town Lübeck, the interesting old buildings of which he appears to have studied very carefully.

In 1828 he visited England and France, and part of Germany. On his return he designed and carried out the Town Post Office, the country seat of the Syndic Sieveking, and other works. In the first-named building, which abuts upon one of the principal canals, he made a bold experiment by omitting the foundation of piles, universally used in the old town, and substituting an arrangement for floating the structure on the soft boggy ground. This, though not altogether successful, at least shows that M. de Chateauneuf was not content to plod on in the beaten track, but that he endeavoured to adopt all modern advances in scientific construction.

In 1832 he again visited Italy, and soon after his return (about 1835), while the impressions of his visit to that classic ground were fresh, he designed the residence of Dr. Abendroth, an eminent connoisseur and liberal patron of the arts. This building, although not on a very large scale, may be considered his chief work, as it affords evidences of great skill in adapting a very effective arrangement of plan to an irregular site, and of refined taste in combining Greek purity of detail with the structural forms of Italian Renaissance. In the interior especially every part, even the smallest detail, bears the impress of a master hand.

In the years 1838 and 1839, M. de Chateauneuf passed much time in England, engaged, in conjunction with Mr. Mee, upon a competition design for rebuilding the Royal Exchange, to which the second premium was subsequently awarded. He was also, I believe, assisted by the same gentleman in the publication of a 4to. work, "Architectura Domestica," London, 1839. To another small work, "The Country House," by Lady Mary Fox, published in 1843, he contributed some excellent designs for a country mansion. The letters which accompany these designs contain many remarks shewing how carefully he had studied the general principles of his art, and the correctness of the views he entertained of the vexed question of style in Architecture.

The great Fire, which in May 1842, destroyed a large portion of the old town of Hamburgh, opened a wide field for the labours of the architect, and it may be safely affirmed that no one strove more assiduously or successfully than M. de Chateauneuf to carry out the restoration of his native city. A commission having been appointed to remodel the plan of the destroyed quarter, he was nominated President, and many of the important improvements effected were originated by him; among which may be specially mentioned the arcaded porticoes by the side of the Alster Canal, and those flanking the square of the Exchange; the former were also subsequently carried out from his detailed plans.

From this time to about the end of the year 1850, M. de Chateauneuf was largely engaged in the erection of numerous buildings, both public and private; among them the rebuilding the great Church of St. Peter, in which he was associated with Prof. Fersenfeldt, the residences for the clergy, and other buildings connected with this church, the new Post Office, the large warehouses, with residences for Messrs. Schulte and Schemmann, and for Mr. Davenport, the Hall of the Tailors' Company, a large warehouse for the Cabinetmakers' Company, and numerous private houses in the town and suburbs. Many of these buildings show great originality both in arrangement, and in the details of the mouldings and enrichments, for which M. de Chateauneuf always made numerous studies. The beautiful details of English Mediæval architecture appear to have made a strong impression upon him, the influence of which may be clearly traced in the works executed subsequently to his visits to this country.

In 1846 he married a Norwegian lady of Christiania, and on paying a visit to that city, the restoration of the Church of "The Redeemer" was entrusted to him; he was also employed to prepare a design for another church, which was subsequently carried out from his plans by a former pupil. Although still in the prime of life, he began now to feel the effects of constant application upon his naturally earnest and somewhat excitable temperament, which, combined with some domestic afflictions, caused his health visibly to decline. He made, however, another great effort, and produced one of his grandest architectural conceptions in the design submitted in competition for the Storthing Haus at Christiania, which, however, was not carried out, as the estimated cost exceeded the proposed expenditure. This was his last work, and it formed a worthy termination to his professional labours.

In 1850 it was found advisable to place him under the care of Prof. Sessen, in a private asylum near Kiel, which had been erected from his designs; he subsequently, however, returned to his native city, where he died on the 31st of December, 1853.

Throughout his life his energetic character led him to feel a lively interest in all public affairs, and he took an active and leading part in the local Kunstverein (Art Association), and the Society for encouraging Arts and Manufactures; he was also an Honorary and Corresponding Member of the Royal Institute of British Architects. He was thoroughly devoted to his profession, and, an accomplished artist himself, he took great delight in the society of his brethren of all classes, whom he frequently consulted on the subject of his principal designs; thus promoting that reciprocity of action so desirable between the sister arts. Those of foreign countries always met with the kindest attention and hospitality at his hands, and he had thus procured the warm attachment of a large circle of friends, by whom his premature death will long be regretted.

A vote of thanks having been passed to Mr. Charles Fowler jun. for the Memoir, Mr. **Donaldson**, H.S.F.C., proceeded to give a description of the streets proposed to be formed by the Metropolitan Board of Works. He observed that as the attention of Parliament would soon be called to these projects, he thought it might be interesting to the Members to be made acquainted with them, and he was happy to be able to submit the engraved plans, which had some time since been kindly presented to the Institute by Mr. Marrable. The first and shortest of the new lines was the one on this side of the Thames, its purpose being to connect King Street, Covent Garden, with Leicester Square. It had been long felt, that there was not a sufficient access to Covent Garden Market and Drury Lane Theatre from the West End, and that much confusion was produced by the great traffic in that neighbourhood, especially during the business of the market in the morning, and at night, when the theatres were open; it was also considered very necessary to form the communication so as to continue Cranbourn Street to the Strand, and also to relieve St. Martin's Lane of the traffic between Tottenham Court Road and the northern parts of London with the Strand; and accordingly it had been proposed some years ago by Mr. Pennethorne, under the direction of the Commission for Metropolis Improvements, that a new street should be made in an oblique direction from the east end of Cranbourn Street, at its juncture with Long Acre and St. Martin's Lane, to the west end of King Street;—a line which appeared the more eligible now that the east end of Leicester Square had been opened by the enlargement of Cranbourn Street. On the other hand, it had been suggested, that the line of St. Martin's Passage and New Street would be more desirable, and more direct; but by adopting that line, it would interfere with a much longer line of house property, and involve the necessity of widening an established thoroughfare with a particular class of business (which would incur an enormous expense), and would not provide for the north traffic; and the plan of Mr. Pennethorne, although it was a more abrupt detour than could be desired, would be generally admitted to meet, to a great degree, the difficulties of the case. The Duke of Bedford had offered to contribute some £15,000. towards it; and the plan was sanctioned by the Government Commissioners. But when the new Metropolitan Bill was passed, and the Central Board was organized, all former proceedings were superseded, and Mr. Marrable was ordered to make a fresh survey and estimate. Mr. Marrable, however, after due consideration, arrived at the same conclusion as Mr. Pennethorne, with regard to the route; and his estimate of the cost of the new street was as follows:—

OUTLAY.	£.	RETURN.	£.
Purchase of Property and Contingencies	90,570	Sale of Ground Rents	45,600
Cost of Sewer	4,250	Old Materials	1,200
	£91,820		46,800
		Difference of Cost	45,020
			£91,820

Mr. Donaldson next adverted to the importance of a direct communication from the western parts of London to the Borough, the Railway Termini at London Bridge, &c., in order to avoid the difficulties of the route through the city. Referring to the different plans exhibited, he called attention to the fact, that the existing line on the other side of the river of the York Road and Stamford Street constituted the greater portion of the communication now projected by the Metropolitan Board: and that a continuation of the latter street eastwards to the Borough would complete the line. One project to effect this latter section between Blackfriars and London Bridges was along the south bank of the river [as shewn upon the map]; but any line of this kind must pass either under or over Southwark Bridge Road, which would be very objectionable, and therefore such a route was dismissed from the minds of most practical men; as, in addition, St. Saviour's Church offers a great obstacle; for the church itself would be more lost to sight than at present, or must be entirely pulled down. But a proposed line more southward would also interfere directly with the Borough Market, Messrs. Barclay's premises, and other property, which no man in his senses would think of touching for such a purpose. Mr. Donaldson next described the line proposed by the Board of Works [referring to the map], which commenced at a point north of the Town Hall, Southwark, and terminated opposite the east end of Stamford Street. This line is necessarily curved, in order to avoid, whilst closely infringing upon, the College, Alms Houses, Messrs. Barclays' premises, Messrs. Potts' Vinegar Works, Hopton's Alms Houses, the premises and market of the Hop Planters' Company, Messrs. Easton and Amos' Foundry, &c. The estimates for this line were as follows:—

Outlay.	£.	Return.	£.
Purchase of Property	510,549	Sale of Ground Rent	165,390
Sewer	8,875	Property re-sold, and Sale of old Materials	33,363
			198,753
		Difference, or nett Cost	320,671
	£519,424		£519,424

But towards this cost there was already about £90,000. in the hands of the Government. Contrasted with the above plan, Mr. Donaldson described [referring to a map] the route laid down by Mr. Pennethorne in 1853, being a straight line from a point near the Lambeth side of Hungerford Bridge, which it is proposed to widen to a carriage way, passing close to the north side of Surrey Chapel, direct to the Town Hall in the Borough. This line it was also proposed to continue eastwards to Bermondsey, and westwards by a curved line to the Surrey foot of Westminster Bridge. The main portion of the line passed through a very inferior description of property,—the estimate made by Mr. Marrable being as follows:—

Outlay.	£.	Return.	£.
Purchase of Property, Good will, and cost of Sewer	895,104	Property resold, Sale of Ground Rent and old Materials	631,794
		Difference, or nett Cost	£263,310

Mr. Donaldson briefly referred to another admirable project by Mr. Pennethorne, in 1844, for a line direct from Westminster Bridge to St. George's Church in the Borough, on through Bermondsey, which would then be opened up to general traffic; as also to another scheme for widening the existing line of the New Cut and the streets beyond Surrey Chapel westward to the Borough, as a cheap method of meeting the required object. He concluded by impressing upon the Meeting the superiority of Mr. Pennethorne's plan over that about to be submitted to Parliament, as being shorter, more economical, and as bringing into more direct play and communication Westminster, Hungerford, Waterloo, Blackfriars, and London Bridges.

Mr. Jennings, Fellow, suggested, that it was almost as important to provide a communication from Waterloo Bridge to London Bridge, as from the West End: and further, that a line skirting the water was greatly required;—especially with a view to the improvement of the river side property, between London and Blackfriars Bridges.

The thanks of the Meeting were voted to Mr. Donaldson for his communication.

Mr. M. D. Wyatt, Hon. Sec., having read the Report of a Committee appointed by the Council of the Institute to examine the Soulages Collection, and report as to recommending the purchase of the same by the Government.

Mr. Talbot Bury, Fellow, observed that the articles of decorative furniture in the Soulages Collection were of particular value and interest in an historical point of view, as elucidating the progression and amalgamation of the different styles.

Mr. J. G. Crace, Contributing Visitor, said that the public were much indebted to the Institute for deputing the Committee to examine and report on this Collection. When he first heard of the existence of the Soulages Collection he had been most anxious to ensure its purchase by the English nation, and had, accordingly, assisted in forming the Guarantee Fund for bringing it to this country. He confessed that he was rather disappointed that the Collection did not contain more specimens of decorative furniture (in which case it would have been more to his own taste); but such objects were very difficult to be obtained. He specially admired the specimens of Majolica—which were not only interesting in themselves, but highly suggestive to artists—the arabesques and other designs upon those works reflecting the minds of the most able men of the age in which they were produced. To show the extent to which this kind of material might be employed in architectural decoration, Mr. Crace referred to the state rooms of the Medina Celi Palace, at Seville, the walls of which, from the top to the bottom (twenty feet high), were covered entirely with tile work of the most beautiful patterns: these works, although within a week's journey of England, were entirely unknown to English architects. The mirrors in the Soulages Collection were extremely interesting. Besides the circular mirror (of which a photograph was before the meeting), there was a square one on the table in the first room at Marlborough House, which was remarkable for delicacy of expression; and in another specimen the decoration consisted of simple lines inlaid in ivory, showing that whilst the style of the period was in general remarkable for an abundance of ornament, yet that occasionally the artists of the period were content with a severe purity of taste. The chairs of the X form were exceedingly interesting, as representing a type which was perhaps 1,000 years old, and which strikingly recalled the Gothic feeling of many examples to be met with in England. There were also some chairs inlaid with ivory, in a manner which only practical men could thoroughly appreciate. The difficulty of this kind of manufacture was very great, and the excellence of the workmanship must have been quite as great, to enable them to have lasted in such perfection for 300 years. The cabinets and buffets were good in their way, displaying boldness of execution and the touch of a master—although, perhaps, not of the highest class. These works could not fail to be highly interesting to English workmen, who would readily perceive the superiority of their mouldings to the everlasting ogee and other standing forms to which they had been restricted. It was to be hoped that the minds of masters also would be affected in a similar way, and that the practice of putting together mere packing cases, with cornices copied from King William Street, would thus be abolished. He believed that, even in a commercial sense, Government money could not be better spent than in accumulating objects of this description for educational purposes. The collection of the Hotel de Cluny, at Paris, far surpassed any collection yet formed in England, and furnished a strong stimulus to exertion in this country. Furniture to the value of many hundred thousand pounds, and silks to the value of millions, were annually exported from France—not because such objects could be produced there more cheaply than in England, but because they were stamped with a degree of taste which English works did not possess. It was most desirable that the Government should, by every possible means, enable the English manufacturer and artist to compete with those of foreign nations.

Mr. Donaldson made some remarks on the importance and interest of the Soulages Collection, and on the variety of ideas which it furnished, and which might be applied in various ways, and to other styles of art. He referred particularly to the dressoirs and buffets, with their acroteria and other ornaments, as contrasting most favourably with the ordinary side-boards of the middle class in England. A great amount of design and invention was also exhibited in the chests and coffers in the Collection. The chairs referred to by Mr. Crace were modelled after the curule chairs of the Romans.

Mr. M. D. Wyatt, Hon. Sec., stated that copies of the Report had been forwarded to the President of the Board of Trade and the Chancellor of the Exchequer, in the hope that the purchase of the Soulages Collection might be considered in the Government Estimates.

ON BEAUTY IN ARCHITECTURE AND ITS ALLIANCE WITH THE PAST.

By John W. Papworth, Fellow.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, Feb. 23d, 1857.

Some of the following remarks may appear to be equally adverse to the views entertained by both the parties engaged in the theoretical or practical battle upon the question of style; it must therefore be allowed me to use a plea, fairly set out in the "Athenæum," that to a large mind all forms of art have a meaning and a beauty. There is no necessity to pit the Gothic against all others. Each style of architecture arose from the desire to engraft beauty upon necessity, and its existence is a proof of its use.

Art is "catholic" by being "universal," or "extending to all;" Geometric Middle Pointed architecture is to be judged by the same laws of criticism as Flowing Middle Pointed architecture; First and Third Pointed are amenable to those laws, as well as Renaissance and Romanesque, Palladian and Roman, in short, as well as all other styles that have ever existed, or may be produced. If this be true, there ought to be somewhere a code of æsthetics, and this it was my endeavour to find before venturing in 1843 to offer to the Institute an essay in answer to its question—Are synchronism and uniformity of style essential to beauty and propriety in architecture? In the search it was natural, besides consulting Reynolds, Quatremère, and others, to look into Pugin's "True Principles of Pointed or Christian Architecture;" but this work contains nothing that is universally true and not to be found in Vitruvius. To be convinced of that fact it is unnecessary to go further than the first page of Pugin's book, where we find that "the two great rules for design are these—1st. That there should be no features about a building which are not necessary for convenience, construction, or propriety. 2nd. That all ornament should consist of enrichment of the essential construction of the building;" and Pugin adds, "the neglect of these two rules is the cause of all the bad architecture of the present time." Now, according to the analysis of architecture given by Vitruvius, a design which provides all the essential requisites, so far as expense and circumstances will permit, thereby fixing the general scale of the composition, which proportions their sizes to their uses on this general scale, and which arranges them in the most convenient manner, is complete in the *utile;* if it also affixes graceful proportions to all these parts, entwines them with a unity of ratios, so far as is consistent with their usefulness, and then places these graceful parts in good relative positions, maintaining consistency throughout, such, we say, is a perfect design, so far as art can make it. These operations of the architect are, or ought to be, subservient to one consideration, and controlled by one principle, viz. the unity of action of the mind. There will be no difficulty in apprehending this principle; it is one of those truths whose demonstration we readily find within ourselves. The mind appears to apprehend by one and the same intuitive act, both the form of a body and the colour with which that form is invested; but it can only enjoy, one after the other, the impressions produced by the form and the colour. It is not indeed impossible to catch in conversation a few words from two persons speaking together, but no one can follow out the reasoning of two speeches delivered at the same time; so, also, in the pantomimic art, or what remains of it, we hear the musician and see the performer of the ballet, but to one only can our attention be given.

Whatever tends to prove the "unity of action of the mind," and the impossibility of its being so divided as to pay attention to two concurrent sensations equally, also establishes the law of "unity" in art, whether considered with regard to the respective properties of the several Arts, or with regard to the elements of which the work of an individual art is composed. By this law of "unity" the artist is obliged to maintain "uniformity," or an "even tenour," in the composition and execution of his works in order to render them clear, intelligible, and harmonious to the eye and satisfactory to the mind of the spectator. Closely connected with this "even tenour" of the whole is the principle of the "conformity of two things to one pattern, which is "uniformity" in the popular notion of the meaning of the word "symmetry," viz. a parity of parts; this requires similarity, or rather an almost identical repetition in the wings of an edifice as much as in the arms of a man. The number of other cases which might be cited is very great, but two more will be sufficient, viz. something more than a balance, actual repetition, is required for ornaments often repeated or prominently displayed, and for buildings opposed to each other, in certain situations. Should there occur any capricious disorder, the impression made on the mind will be much too weak to produce even an agreeable sensation. It will only be requisite to cite as examples the appearance of some approaches to bridges, compared with those that are uniform, or with the admitted effect of a divided crescent or terrace, and the irregular, incongruous, disjointed appearance of an edifice in which the wings are of unequal length, height, or arrangement; to which may be added, the incomplete effect of a building which has a mass at one end of its front, as was so long the case at the corner of Downing Street and Whitehall.

As each of the fine arts must have its "unity" or "uniformity," so each must have its corresponding "variety." If "variety" be confounded with "universality," if an over-estimate be made of the power of the mind in its combination of objects, and an excessive freedom be thereupon allowed to taste, then every work will necessarily present a complication of designs, instead of a well arranged design, and the mind with its utmost attention will hardly be able to grasp them. If "variety" be considered as synonimous with other words, expressive either of a different idea, or of the same idea under very different relations, and any artist should think of mingling styles, periods of a style, or local peculiarities of a style, let him imagine a poet combining in one work two languages, or two periods of a language, or the refined and the vulgar of the same period. The outcry raised in all countries against those who powder their discourse with foreign terms for which there are native equivalents, should warn the architect against falling into a similar error in his own art, and prevent the application of detail formed to suit the requisitions of one style to a design invented in other feelings of composition. The same law, known in other arts, as propriety of costume, and exampled by the practice of our standard writers, should guide the architect when, amid the stores of ornamental decoration offered for his selection, he runs the risk of choosing details peculiar to an early period of a style, and introducing them into a composition invented in the spirit of the perfection of that style, and vice versa.

It is questionable whether any change of style, or of detail, beyond what actually occurs during the execution of the design, is not a violation of truth and probability; and whether the converse is not equally just, namely, that any addition or restoration (renovation) made after the execution of a building, except in a totally different style, is not an act that is somewhat fraudulent to our contemporaries and to posterity. Let me introduce to your notice the sentiments, on this subject, of the Council of the Society of Antiquaries, and of the Ecclesiologist Journal, which last authority (v. 7, p. 161), observes that there are but three systems of conducting a restoration, viz., the Destructive, the Conservative, and the Eclectic. Our ancestors seem to have universally followed the first or Destructive course, which is that recommended by Mr. Ruskin; they were of course right; they took no care of the original style, arrangement, and proportion, but sacrificed any earlier work to their own feelings of preference for developement. We must imagine what would be said if some works were destroyed on such grounds by any living architect. As for the "Eclectic," this is preferred by the Ecclesiologist, because it is so very vague a course; there are absolutely no rules to teach us when to venture to destroy, when to be content with restoration; indeed, the only rule would seem to be the silent assent given to the proposal for destruction. The "Conservative" course reproduces the exact detail of every piece of ornament which presents itself; as to this course, which looks at first sight, as the Ecclesiologist pronounces it, the safest, we must read the following memorandum as drawn up by the Executive Committee and approved by the Council of the Society of Antiquaries of London:—

Restoration.—The numerous instances of the destruction of the character of ancient monuments which are taking place under the pretence of restoration, induce the Executive Committee, to which the Society of Antiquaries has entrusted the management of its "Conservation Fund," to call the special attention of the Society to the subject, in the hope that its influence may be exerted to stop, or at least moderate the pernicious practice. The evil is an increasing one; and it is to be feared that, unless a strong and immediate protest be made against it, the monumental remains of England will, before long, cease to exist as truthful records of the past. Much as these monuments have necessarily suffered from time, and much as their decay is to be attributed to the neglect of their owners, the members of the Committee have no hesitation in expressing their conviction that (*since the Conquest*) these two causes combined have inflicted less injury than the indiscreet zeal for restoration. Though time and neglect may impair, and eventually destroy, they do not add to a building; nor do they pervert the truthfulness of monuments. Restoration may possibly, indeed, produce a good imitation of an ancient work of art; but the original is thus falsified, and in its renovated state it is no longer an example of the art of the period to which it belonged. Unfortunately, too, the more exact the imitation, the more it is adapted to mislead posterity; and even the best imitation (probably *meant for "restoration,"* or *"such imitation"*) must unavoidably impair the historical interest and artistic value of the prototype, so that, in truth, a monument restored is frequently (*it might have been said "always"*) a monument destroyed. Did the public at large really know how imperfectly the principles and practice of ancient art are understood, and how very few of the so-called restorations have any just pretensions to fidelity, or could they appreciate the rash presumption of those who in general recommend and undertake such work, much less would be heard of money being lavishly spent in thus perpetrating irreparable mischief with the best intentions. The Committee strongly urge that, except where restoration is called for in churches by the requirements of divine service, or in other cases of manifest public utility, no restoration should ever be attempted, otherwise than as the word "restoration" may be understood in the sense of preservation from further injuries by time or negligence:—they contend that anything beyond this is untrue in art, unjustifiable in taste, destructive in practice, and wholly opposed to the judgment of the best Archæologists.

There is evidently a sentence wanting—some few words to the effect, that what the chisel spares in cutting the drag destroys in scraping; and, at the present rate of restoration, we shall not have, fifty years hence, a trustworthy monument of antiquity.

If beauty be the assemblage of graces, then the philosophical definition of beauty would be fitness, harmony and character; each of which is only a phase of what we understand by the word "propriety." On this propriety rests my conviction that "synchronism" (or uniformity of style, uniformity of locality, and uniformity of period) is essential, as well as "uniformity" of general and of particular features, to the highest class of beauty in architecture:—that the two alone do not constitute beauty, is possible. "To the highest class," for there is a class of beauty in architecture, to which the observance of the laws arising from the foregoing principles does not appear to be necessary, according to its adherents. The experience of every age shows that in all the relations of enjoyment we regard, with extraordinary indifference, perfection itself, when that limit is reached to which mortal efforts may attain. While proclaiming the authority of his name, as the founder of a school of pure drawing and invention, the scholars and successors of Raffaelle, from their anxiety to surpass what was simply excellent, insensibly changed the style of Italian Art, by the production of a series of fascinating novelties, from which alone they could hope to attain, of their contemporaries, that approbation with which they were rewarded.

The consequence in architecture of this passion for change is the existence of a double beauty in the art: one, the sensuous beauty of the painter; the other, the mental beauty of the architect. While the first admits of a licence which constitutes one of the chief attractions of the Mediæval and of some of the Eastern styles (though in these only a certain amount of irregularity is admissible); the last, which, for want of a previous distinguishing appellation is here termed Sculpturesque Architecture, demands synchronism and uniformity. The influence of the first sort of beauty exerted on the passions through merely visible or sensuous means consists in lightness; in intricacy of form, light, shade and color; in variety of tints; in irregularity; and to some extent in mixture of style. Irregularity is certainly an ingredient of beauty, so far as it affects the organs of sense only; and, as it is admitted by both Payne Knight and Price, this species of architectural beauty is that which painting can, and which sculpture cannot, express. Painters delight not only in irregular trees, but in irregular buildings; and in buildings irregularly mixed with trees; which afford more variety of tint, and more luxuriant play of light and shade, than any regular combination of parts can produce, though that may be required by the understanding in other instances. The sentiments produced by the other are the approved effect of a general discriminative judgment, sound feeling, and refined fancy, implanted in the mind of man, and improved by exercise, study, and meditation.

The efforts of the one (which has received the name of Picturesque Architecture) lead to the same end, and produce the same vitiation of taste, which prompts the neglect of the best masters for the performances of Teniers and similar painters; pictures with which our galleries are crowded, not so much for the beauties of their coloring (which might form an excuse in many cases, for the partiality of the purchasers, had the wealthy great the knowledge to appreciate them), as for the gratification of a fashion introduced by that sensuous taste which in literature revels in the mysterious, the horrible, the romantic, the disgusting, and the vulgar. But it belongs to Sculpturesque Architecture to embellish and aggrandize the thoughts, whose impression it stamps on the material, in proportion as it wishes to induce in the spectator grand or sublime ideas of the edifices which it constructs; to this end it uses those principles of beauty developed in the preceding analysis, while it must be guided by the laws which form their corollaries, in exhibiting harmonious yet brilliant and contrasted combinations of light and shade, blended but not confused, and broken (not cut) into masses. That this division and distinction between the two species of beauty in architecture may not seem hypercritical or disingenuous, we must avail ourselves of an opinion expressed with the full approbation of Pugin, an artist well known for, perhaps, a too partial feeling for picturesque architecture. The Rev. G. A. Poole (Lectures, 1842,) says: "The senseless uniformity of modern design is one of its greatest defects. The idea of everything being exactly alike on both sides, has created an unreal style of building which was quite unknown to our ancestors. When once the trammels and bondage of this regularity system are broken through, and people are not taught to consider a portico and two uniform wings the perfection of design, we may expect vast improvements." Here is the opportunity of asking the supporters of this doctrine whether a man, that noblest work of creation, looks well when he has lost an arm? For the last time we will notice the way in which words are made to supply the place of reason. If the author just quoted had left out his epithets, the passage would fall harmless on any ear, the fallacies would be palpable ; for we should hear with astonishment an ecclesiologist pronounce that a nave with an aisle on each side, and a transept of equal arms, with a tower at each corner of the western façade, was defective by virtue of its uniformity, and that we might expect vast improvements by lopping off one aisle, lessening one transept, and putting a spire on one of the towers. Certainly when the artist appears to sacrifice just expression to what he may term grandeur of form and outline, or to a vicious, or rather to a sensuous, desire of embellishment, he must be working against the resources which his art offers to him. Form, considered in the abstract, *i.e.* divested of character, is neither grand nor mean; else since the effect of the Farnese Hercules is comprised in the exhibition of great, but quiescent, muscular power, it might be expected that exaggeration of the parts would produce greater dignity, whereas the result would exhibit the disgusting appearance of a bloated pugilist. Nor can he then deeply interest the mind of the spectator by beauty, of the highest order, arising from ideas and contrivances happily expressed, and springing from the circumstances, the incidents, and the requisitions, of a consistent whole.

The blind admiration with which works in both species of architectural beauty are regarded, precludes all discrimination on the part of either the feeling or the judgment. Mr. Street, in summing up the results of his last journey, informs us that " Greek architecture was the art of men in a state of nature, unskilled in science, but well skilled in lovely outlines, and possessed of a most delicate appreciation of form ; rude, therefore, in their contrivances and construction, but delicate and refined in all their ornamentation; its followers wasted labour incalculable in the placing together of great blocks of stone or marble, so as to bridge the necessary openings in their walls, and then lavished with a noble bounty all their art in the decoration of what would otherwise have been the clumsy masses of their buildings. Gothic architecture, on the other hand, was essentially the work of scientific men ; the most consummate skill being displayed in arranging thousands of small blocks of stones, any one of which might be carried upon a strong man's shoulders, into walls rising far in height above anything ever dreamt of by the Greeks, bridging great openings, and providing (by the exact counterpoise of various parts) for the perfect security of works whose airiness and life would seem to have lifted them out of the region of constructive skill; and yet all these wonderful works were executed in materials as ponderous in their nature as those which the Greek had handled so rudely in construction, and so delicately in ornamentation. The natural result of this excess of science was, perhaps, that less delicacy and beauty of detail became necessary; for when the plain rough walls, without carving and without ornament, were of necessity so beautiful in their intricacy of outline and delicacy of structure, and when too so little (comparatively) plain surface remained to be looked at or dwelt upon, men cared less for the choicest examples of the sculptor's art, and were less obliged to satisfy the eye with them." Such systematic unfairness seems rather habitual in some writers led by fashion. Not to be delighted with what the artists hear in general terms is fine, might argue a want of capacity on their part to comprehend, or a want of taste to relish its merits ; to avoid such an imputation, there are the resources of decrying the merit of the style least in fashion, and to applaud that which is most in vogue ; to escape the probability of censure, or from an excessive and shameful indolence, they copied, and still copy precedents without consideration; concluding that every peculiarity, whether understood or not, is one of excellence, and never reflecting that if a beauty, it might be of a sort that any artist could easily display, and that all good artists would anxiously avoid.

The advocates of the round-arch and pointed-arch fashions agree in accusing each other of " copyism ;" as many disputes would never arise if the meaning of the term employed were understood, this part of our subject is worth some brief attention. The truth seems to be that under all the declamation about "the right style in the right place," a principle is mystified, viz. eclecticism in architecture, in other words, what is to be considered copyism? Let us hope that architects are agreed upon one point, that any building will be good that shows elements, proportions, and details, which are agreeable in themselves, and to each other, as well as suited to the materials, expense, and purpose prescribed. Now, if bronze or marble is to be employed, delicate work in the details can be obtained; these must be bolder where iron, plaster, or finely grained stone is used; a coarsely grained stone requires larger work; brick allows few mouldings; terra-cotta is almost extinct with us. These details may belong to any style, or period of a style, or be novel if that be possible; at any rate, those who charge others with copyism, allow that to have precedent for details separately is not copyism; such is my own opinion. Then as to expense, when a wall will stand without buttresses, such features should not be added *ex post facto* for mere decoration; we do not build thick walls, therefore face-ornament must be chiefly employed; we do not like to see damaged work, therefore the ornament which is within reach must be flat; the usual range of the eye is about twenty-five feet, therefore work above that height from the ground must be large in its detail, unless polychromatized; some appear to think that it is not copyism to employ a style to which these and similar principles are opposed, but such is not my own opinion. And, lastly, as to purpose: we shall perhaps have some day better reasons than those above given, why bargeboards and French casements are theoretically abused and practically adopted; why a Byzantine villa is not as good as a Moresque, a Greek, or a Mediæval one; why a Classic edifice should not be covered with pointed panelling; why orientation should be observed; why a church in any style should not be lighted solely from the top; why buildings of cast iron should not necessarily have pointed details and ornaments; and lastly, why churches should not be built of cast iron.

Probably we have arrived at an explanation of "copyism," and if my views are right, we mean not the mechanical repetition of a building, for example, the tower of St. Mary's, Taunton; but the reproduction of the leading features of a building in the same combinations with each other. This copyism has several stages: as when the plan and the elevation alike repeat the original with only slight modifications; or when the plan is almost the same, and the elevation more than slightly differs; or when the elevation is almost the same, but applied to an altered plan; these, if detected, are all stages of copyism: and this copyism, however it may be disguised, is called servile, partial, or free, as the case may be; it does not matter whether Sta Maria in Rotundo, or S. Andrew's Heckington, is the model. Common sense is not to be imposed upon by the word adaptation; if a building be more or less a copy, it is popularly and correctly called a copy. Every one knows that the plans of theatres are copied from preceding ones, with such alterations as experience has suggested; no one accuses the architect of copyism; the fact is known, but he obtains due praise for the adoption of the recent improvements; if the architect were to reproduce the classic theatre, he would be a servile copyist. Every one can understand that a modern barn is very different from one of the last century; if an architect were to repeat one of the fifteenth, he would be a servile copyist. Every one feels that the usual high four, six, or eight columned portico is a reproduction of part of a bygone system, that it is almost useless, and is only employed traditionally; it is the disposition to reproduce this and other types of the classic ages, which has caused the round-arch fashioner to be called a servile copyist. Every one is aware that churches after the Reformation did not require to be duplicates of some built just before that period; that parts of them are useless, and are only employed traditionally; it is the disposition to reproduce the Roman Catholic Church and other types of the middle ages, which causes the pointed-arch fashioner to be called a servile copyist, and in both cases the reproach is just.

This fatal aptitude for copying, does not carry with it that power of adaptation and combination which is requisite to raise the result to the rank of a design; but the ignorance, or the indolence of the artist, stamps all his works with a similarity of character, and he may easily get a reputation for an individual manner, by undeviatingly reproducing, as in a mirror, the deformities which only belong to the individual edifices which have been his models; thus reducing the works of art to mere casting from a mould. A tedium, like that which seizes us in a city where the streets are uniform, is the fruit of this error of confounding "uniformity" as identical repetition, with "unity" as the conformity of two portions to one pattern, the second definition applied above to the word "uniformity."

It will perhaps be noticed, that no mention has been made of association; such a term can have little place in a code of æsthetical criticism; if the thing be in itself beautiful, it is a joy for ever; and it should be thought unadvisable to assail it as proceeding from artists who have no Christian feeling; artists are tempted to retort upon their opponents that the attack comes from men who have no true Christian feeling—there is surely no evidence, in such a course of argument, of charity or of wisdom; and the course itself is as absurd, in relation to architecture, as it would be with respect to the latinity of Professor A's diction, opposed to the nervous Saxonisms of Professor Z's language. For myself, I should be disposed to hail the most violent self-assertion of another species of movement, that of an independent body of architects, who would design buildings according to the purpose, materials, and expense provided, without copyism from any former type; this is the only way to develope a new style, or to develope an old one, which is the same thing. But it is useless for architects to talk of developing an old style when such arguments are used and circulated as have lately been put into our hands. It has been intimated to us, in answer to the cry "Mediæval churches are unsuitable to the Church of England," that the spirit of their style depends upon their composition, by which is meant their plan and appendages; and thus it is admitted, that the plan and its appendages must be copied, servilely copied; yet, if the charge of copyism is objectionable, some should not assert, that "if the essential requirements of a church are simply that everybody shall hear, see, and be seen, there must be an end of all internal composition." This could only have been said by gentlemen who do not choose to seek precedent in primitive and pure Christian architecture for basilican auditorium, with absis, narthex and atrium, and who choose to forget our college-chapels and lady-chapels, with the churches of the Preaching Friars and of the Jesuits. The society of Jesuits, the great advocates of the Roman Catholic tenets, has indeed hitherto employed some of the strangest fashions of the round arch styles, and its churches have generally, I think, had galleries; but it does not therefore follow, that the round arch style and the galleries are unsuitable to the Church of England. Perhaps all will not be inclined to agree to an expression of opinion, that so far as devotion is concerned, it does not matter whether a round or a pointed arch is used in a church; and that so far as taste is concerned, every one should be at liberty to design what he feels suitable to the occasion, nay, even to copy an existing building, if he will confess that his own resources fail him.

For my own part, I venture to adopt, with modifications, another passage from Mr. Street; a correct adherence to the feeling of the established style employed (and not to particular types or characteristic features), with proper decorations in proper places, free from licentious liberties, free from pedantic copying, free from unnecessary repetition, free from ill-executed detail, and free from superfluous embellishments, has at all times, and will always constitute the manner of a great architect; it affords sufficient scope for the exercise of his genius, without allowing him to pass the line which separates imitative variety from universality. The true architects of all ages had in short an intense respect for natural laws, with an equally intense love for experiment and realization, and to these it is that we owe the true nobility and abiding beauty of their works; nor need we in this age despond, for if we be really in earnest in our work, there is nothing which we need fear to miss, nothing which we may not possess if we will, and nothing therefore to prevent our working in the same spirit, and with the same results as our predecessors of the last three thousand years. If a subject be correctly understood, and properly felt, it will of itself supply the mind with appropriate expressions, for the mere use of the pencil, necessary to acquire practice sufficiently copious to enable any person to sketch and draw well, will provide forms in propriety and abundance, if the architect has memory to retain, and judgment to select them; if he has not these, works upon the art, theoretical, critical, historical, or topographical, will never give him either, though they may teach him to substitute fashion for feeling—artifice for nature—and affectation for simplicity. Not to be wearisome—

'Tis just congruity of parts combined,
Must please the taste, and satisfy the mind.

Τὸ γὰρ καλὸν ἐν μέγεθει καὶ τάξει ἐστὶ.—*Aristotle Poetic*, ij. 4.

Mr. M. D. Wyatt, Hon. Sec., said that although the remarks of Mr. Papworth were exceedingly interesting and valuable, he regretted that that gentleman had appeared to abjure the principle and the value of looking at style through the association of ideas. Alison, the greatest writer on the subject,* had followed out with great ability and propriety the exact progress of the mind when first perceiving the advantage of uniformity of proportions, and feeling at such a moment the disconnection of ideas of harmony arising from any divergence from regularity. Alison had shown that the first impulse of the savage in reference to ornament was towards uniformity. His first effort in art was to carve the two sides of a piece of wood or stone in uniformity with each other. But as the mind became educated, there arose a tendency to diverge from uniformity in a degree constantly increasing in the ratio of artificial life, until at last it resulted in the strangest license, such as that which permitted the broken curves of the School of Borromini and similar excesses. Through association of ideas a natural relation in different forms was to be found, which it would be wise for architects to consider. Certain forms were indissolubly associated with certain sentiments, as the pyramid or triangle with solidity; the circle with fulness and plenitude; the oblong or extended parallelogram with elegance, &c.; and on examining these families of forms, they were found to be intimately connected with particular historic styles of art. Hence it was that synchronism became so essential in architecture; because throughout each style some particular feature was predominant, and gave the key note of the style. Hence, in reproducing any particular style, the architect might divest himself of the actual detail, so long as he retained the geometrical principle, which was itself the foundation of the style. For example, he who would restore monuments in which there was a high ideal character of beauty, such as the early Greek monuments, would do well to keep in his mind as the rule of the figure, either the perfect square, the parabola, or the hyperbola; he who would restore the Gothic form of art would do well not to wander far from the combinations of form and ratios arising from the equilateral triangle; and he who would work in the Roman style should keep in view chiefly the simple cylinder, the cone, and the various segmental and re-entering curves; and thus, if he would only avoid mixing those dominants he might safely work in the right style of development. He should also be guided by the structural laws deducible from the actual materials which economy or other circumstances led him to employ. Thus, if he worked in stone, there were certain forms generated by the mason's craft, which, in whatever style he worked, would always be consistent and agreeable. If he worked in metal, he must remember the forms best suited to that material, and that in employing cast iron, a degree of solidity might be allowed which would not be agreeable in wrought iron. Their hope as artists lay, not in discarding laws, but rather in evolving them from necessities, and adopting them as the code and grammar of their art.

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* Essays on Taste.

Mr. **Jennings**, Fellow, said that the subject under discussion depended very much upon the much disputed question whether there was such a thing abstractedly as beauty. In music there was a certain scale, and a certain harmony beautiful to all ears; and it was his own impression that there was something of the same description in respect of beauty of form, and when they had arrived at a knowledge of this, it would be easy to determine what forms were beautiful. There might still be beauties, as in music, which were not exactly harmonious—irregularities being often equally beautiful with regular forms. One great means of arriving at the elements of beauty would be to study carefully the objects which they most admired, and to find out what features in those objects occasioned the pleasant impressions on the mind; and by considering those features with a view to future purposes they would be much aided in arriving at beauty in new designs. There was great beauty to most eyes in extreme irregularity, as shown in the drawing exhibited of Salisbury Cathedral. With regard to the different forms which it was the fashion to consider beautiful at different times, he thought the only proper course was to consider the largest possible variety of styles, in order to arrive at some general principles. The beauty of St. Paul's Cathedral arose in a great measure from the geometrical proportions to be found in almost every part of it.

Mr. **Papworth** said that he had no doubt in the Mediæval and other early times there was a common meter or measure of some kind, which was the foundation of their designs. The way in which all the dimensions of our Mediæval churches might be divided by three feet was very remarkable, and would seem to lead to the inference that 18 inches had been the standard measure, as 13 inches appeared to have been in the French churches. With regard to Mr. Wyatt's remarks on the association of ideas, he observed that there could be no code of æsthetic education. Beauty was in the mind of the spectator rather than in the object seen, and it was impossible for all to agree on this, because it was impossible to educate all men precisely alike. Alison's theory was not that uniformity was the principle of savage decoration, but of the point at which the savage arrived when he had become civilised; and he (Mr. Papworth) had failed to recognize any uniformity in the decoration of the New Zealander's face, which had been cited by Mr. Owen Jones in his "Grammar of Ornament." There was one invariable type—that of female beauty, and it was remarkable that the hair of the female, unlike that of the male, was always parted in the centre.

Mr. C. C. **Nelson**, Hon. Sec., wished to ask whether in the "Seven Lamps of Architecture," Mr. Ruskin had not expressed opinions very opposite to those ascribed to him by Mr. Papworth?

Mr. **Papworth** said that his quotation was from Mr. Ruskin's Edinburgh Lecture.

The **Chairman**, Mr. Ashpitel, Fellow, said that Mr. Ruskin contradicted himself very frequently. It was, indeed, almost an insult to the public, that in the same book which enforced the system of the pre-Raffaelites, the latest works of Turner should be equally eulogized; works executed when his eyes had failed him, and which were so unintelligible that the men who had to hang them could not tell the top from the bottom. Mr. Ruskin seemed to have adopted the idea that it was necessary to do or say something startling in order to be talked about. It was not the custom, however, now for people to think for themselves, but rather to build their faith on their favourite author or newspaper, thus holding out a premium to such authors as Mr. Ruskin. He could understand that gentleman's peculiarities if he were only consistent; but his object seemed to be merely by a great deal of glittering verbiage to bring himself into notice. With reference to the drawings exhibited by Mr. Papworth, the Chairman referred to the Basilica at Vicenza, the effect of which he observed, when he first saw it by moonlight, was very striking. This building shewed the importance of considering the site of any structure in criticising its design; because its very lofty roof, which formed a striking feature internally, would have been most incongruous in external elevation if the building had not been so placed that the roof was invisible. To reproduce such a design in an open space would be a gross blunder. With regard to beauty in the abstract, it was true that all men could not be educated to agree to call an object beautiful; but he concurred with Mr. Jennings in believing that there were some forms which must strike every eye with admiration, whether savage or civilized. After all, no rule or canon of taste of universal application could be laid down—for the most conflicting rules would often equally produce beauty. It came, after all, to the story of the two competing Greek architects, one of whom produced a most elaborate plan, of which the other said, "I cannot understand it, but I can do it—I can build the building, which I am afraid my friend cannot." These things were very much matters of intuitive perception, depending not altogether on the education of the mind, but on a peculiar acuteness of perception and tact, which it had pleased Providence to bestow upon some men more than others. All the knowledge and all the perception in the world however could be of very little use without common sense, which would best enable them to fully appreciate the beautiful, whether in poetry, painting, music, or architecture.

Mr. M. D. **Wyatt** begged to express a friendly protest against the Chairman's remarks on Mr. Ruskin. Those who knew that gentleman were perfectly aware that he did not make literature a profession. No one could regret or repudiate more than himself the tone of much that Mr. Ruskin had written; but it should be remembered that, if there was an awakened interest in the public mind respecting their profession, a great deal was due to Mr. Ruskin for sounding the alarm; and if he had not shown them the way to go, he had at least said, "Gentleman, you must go some way."

A vote of thanks to Mr. Papworth, for his paper, was then unanimously carried.

Mr. **Fraser**, Contributing Visitor, called the attention of the meeting to an article in the newspapers, from which it appeared that a suspension bridge was to be erected across the ornamental water in St. James' Park. This he considered would be a very great eye-sore. Where there were high tides or violent currents suspension bridges were most useful (as in the cases of the Britannia and Conway Bridges); and in France such bridges were properly employed from motives of economy; but over a quiet lake, as that in St. James' Park, always at the same level, a suspension bridge was totally out of place, and would by no means add to the beauty of the scene. No painter would introduce such an object in a landscape, as the pictures of Poussin, Claude, Wilson, Turner, Stanfield, and Creswick sufficiently proved. The bridge of St. Angelo at Rome, that at Prague, and that in Blenheim Park would furnish examples of what would be appropriate. These bridges were perfectly flat, the piers being continued above the parapet, and surmounted by beautiful sculpture. In this case there might be three arches in the water, and one on each bank, and there would be no occasion to raise the arches more than a few feet above the water. To introduce a chain bridge in an ornamental park was perfectly incongruous, and he hoped there would be some expression of opinion on the subject by the Institute, which would prevent it becoming the laughing stock of foreigners. Fortunately there was yet time, as the bridge was not built.

Mr. M. D. **Wyatt** said, that as his name would probably be hereafter associated, to some slight extent, with the bridge referred to, he would explain the circumstances connected with it. He begged to say publicly that he agreed with the general principle laid down by Mr. Fraser, and considered that a low bridge on arches, recalling the Palladian bridge at Wilton, would have been a more classic and picturesque object in St. James' Park than any suspension bridge could possibly be made. When he was applied to by the late Mr. Rendel the matter was a *fait accompli.* Mr. Rendel's engineering arrangements were nearly completed, and it was in respect to the precise forms of all the iron work that could be made in anywise subservient to the laws of beauty, that his assistance had been invited. All that he himself had to do with the design had therefore, been to arrange the detail of the ironwork in as appropriate and reasonable a manner as possible. This he trusted it would be found he had done.

Mr. MATTHEWS, Associate, stated that a design for a Palladian bridge had been prepared in Sir C. Barry's office; but that the suspension bridge was entirely the wish of Sir B. Hall, who over-rode the Palladian form altogether.

Mr. JENNINGS said he believed the feeling was that any bridge in the proposed situation would be an evil, but that a suspension bridge would be more in the nature of an invisible fence, and would not cut the park so visibly across as a stone bridge would have done.

Mr. M. D. WYATT explained, that the moment a bridge was proposed at all the public raised a great outcry against it. This was met by the promoters of the plan with a suggestion, that it would be sufficient just to throw something nearly invisible in wire across the lake, and which would consequently be no eyesore. This was all very well in the hands of amateurs, but when they went to Mr. Rendel, he no doubt perceived that "invisibility" could never be achieved; that they must have strong points of support, and something massive to hang the roadway from, unless they would have piers in the water. He was bound to design a bridge that would stand, and had accordingly made a most ingenious design, which was a combination of the lattice with the suspension bridge. There were, of course, chains and certain rods, but as few as possible; the balustrade being a lattice, and the whole forming a very stiff and light bridge, the engineering details of which had been worked out most skilfully by the sons of the late Mr. Rendel.

Mr. PAPWORTH inquired whether the bridge was to be painted green or blue.

Mr. WYATT said, that his advice to the late Mr. Rendel had been to paint it grey, and if there was any money to spare to relieve certain parts with gilding.

The meeting then adjourned.

Previously to the reading of Mr. Papworth's paper, Mr. C. F. Hayward, Associate, called attention to the dilapidated state of Sir C. Wren's model of St. Paul's Cathedral, with a view to memorialising the authorities to effect a restoration, and to place it in a more advantageous position. Mr. M. D. Wyatt, and Mr. Parris, Visitor, explained that the subject had not escaped the attention and care of the Surveyor to the fabric.

Mr. Twining, Contributing Visitor, then exhibited some sketches of churches in Bavaria. The towers, he stated, were generally surmounted by small cupolas, modelled after that of the Cathedral of Munich, but modified in various ways; and it appeared to him that these cupolas, though by no means beautiful in themselves, harmonised with the rocky outlines of the Bavarian Alps much better than the spires of the Tyrolese churches assimilated with that mountainous region. The spire, in fact, was chiefly effective in flat and level countries The effect of the colossal statue of Bavaria was much impaired by its being placed on a vast plain, without sufficient underwork to elevate it and separate it from the general surface of the country. From the want of a more elevated site, it only excited interest on a comparatively close view; whereas the statue of San Carlo Borromeo on the Lago Maggiore, though incomparably inferior as to execution, formed an attractive object from a distance. Mr. Twining also exhibited sketches of the common form of the houses in the Tyrolese Alps, which although somewhat similar, differed in points of detail from those of Switzerland. The castles of the same country were numerous and interesting, but having been constantly kept in repair they did not form such picturesque objects as the castles on the Rhine. Referring to a view of the entrance to the town of Salzburg, Mr. Twining explained that it was partly built with masonry, and partly cut out of the face of the rock; and that this mode of execution might be advantageously adopted for the entrances to railway tunnels.

Corrigenda in the Discussion on the Paper read February 23, 1857—page 101, line 19—for Mr. Papworth's remarks, read the following:

Mr. Papworth said he had no doubt that in the Mediæval, as in earlier times, there was a common meter or measure of some kind which served as a foundation for design: the way in which the leading dimensions of the Mediæval churches might frequently be divided by three feet was very remarkable, and would seem to lead to the inference that 18 inches had been the standard of measure, as 13 inches appeared to have been in the French churches.* With regard to Mr. Wyatt's remarks on the association of ideas, he had previously observed that such a term could not find a place in a code of pure æsthetics; for if beauty were in the mind of the spectator, rather than in the object seen, it would be as impossible for people to agree what beauty was, as it is impossible to educate all men precisely alike. Alison's theory was incorrectly applied: uniformity was not the principle of savage decoration, but of the point at which the savage arrived when he had become civilized; and although he (Mr. Papworth) had failed to see beauty in the uniformity of the decoration of the New Zealander's face, which had been cited by Mr. Owen Jones in his "Grammar of Ornament," he would appeal to the one invariable type in Europe, that of female beauty; and it was remarkable that on that continent the hair of the female, unlike that of the male, had almost always been divided from the middle of the forehead.

Page 102, line 10, for "plan," read "theory."

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* See on this subject Cresy's Encyclopædia of Civil Engineering, Supplement.

ON THE DIFFERENT THEORIES RESPECTING THE FORUM AT ROME, PARTICULARLY THOSE OF OUR LATE MEMBER, THE COMMENDATORE CANINA.

By Arthur Ashpitel, Fellow, F.S.A.

Portion read at the Ordinary General Meeting of the Royal Institute of British Architects, March 9th, 1857.

The Forum at Rome has lately attracted the interest which a subject so important to the scholar, the archæologist, and the antiquary deserves. The most learned men among the Italians, Germans, and English, have given their utmost attention, and thrown all their powers into the investigation. Every attainable source, whether classic or Mediæval, that could throw light upon it, has been ransacked; the most abstruse authors—the most obscure inscriptions—the slightest notices—have all been eagerly seized on, and theories on theories built up, the most contradictory that can be conceived. It is, and has been for some time, the *cheval de bataille* of most great scholars; and it seems almost a reproach to any learned body that they have not devoted their especial attention, at some time, to forwarding its investigation. To me the subject has a peculiar interest, not only from its intrinsic value and importance, but because it was the favourite study of my friend, our late Member, the celebrated Luigi Canina, with whom, and with another valued friend, Doctor Emile Braun, I have walked, again and again, over every part of the site, and paused over every stone, while I listened to their discourse and discussed every theory with them. I do not think, however, that I should have ventured to rise before you to-night, but that Canina himself, just before his last departure from England, requested me personally to take some opportunity of making his views more generally known to English architects; to justify him, as far as I conscientiously could, from the attacks of his adversaries; and particularly to enlist the sympathies and support of his professional brethren in his favour. It has been too much the custom of learned men lately, from the height and in the strength of their position, to dictate to others respecting their especial business or profession. The architect in particular has been the greatest sufferer from this assumption. He is, literally, supposed to know nothing. The scholar, learned in books only, and the arrogant amateur critic, little think how a practical eye will detect fallacies which look so well on paper. In fact, it is only the union of mind and scholarship with great practical knowledge, that can lead to any satisfactory results in the investigation of architectural archæology.

It is thus that our talented Member, Professor Willis, has done so much for our Mediæval architecture—as, for like reasons, I trust I shall show our late Member, Canina, has done for that of Rome. A few short months have taken from us both him and Dr. Braun, without doubt the two best classic archæologists of the day. I think it may not be thought presumptuous in me to bring this subject under your notice, as I regard my late friend's last expressions to me as a sort of legacy, and will endeavour to lay before you the most promising points of interest in the investigation.

Before going into the history of the controversies on this subject which have occupied the learned, it may be well to allude to a few of the sources from which authorities have been derived. Of course every allusion in all the classic writers has been eagerly examined, and, in addition, the scholiasts and commentators upon them. The curious, though imperfect treatise of Varro, de Linguâ Latinâ, has been found of immense service. Of inscriptions, one of the most valuable is the Monumentum Ancyranum.

But the most useful of all have been some early MSS. in the Vatican. One is called the "Notitia Dignitatum utriusque Imperii." It is a statistical account of the Roman Empire, at the end of which is appended a description of Rome itself. The next is a MS. called "Curiosum Urbis." Both these are descriptions of the various regions or wards—fourteen in number—into which Augustus divided the city. They contain, first, the names of every public building and object of notice; then the number of streets and houses; the number of the officers appointed to them—or Common Councilmen as we should call them—the number of the warehouses, baths, fountains, bakehouses, &c.; and lastly, the measure of their circumference in Roman feet. That these MSS. are as late as Constantine is clear, because they mention his basilica; but they cannot be much later, as they contain no notice of any Christian building.

Besides these, there are two other similar catalogues, by Publius Victor and Sextus Rufus; but they are so corrupted that they are of but little authority.

Another curious manuscript was found by Mabillon at the Monastery of Einsiedlen in Switzerland. It contains the routes to all the principal churches at Rome, and, what is very valuable, the different inscriptions on the various public buildings. It is probably of the date of the 9th century, and, from its having no name, it is generally cited as the "Anonymus Einsiedlensis."

Another very curious and valuable Mediæval MS. is the "Ordo Romanus," which contains directions for the routes of the various religious processions, and in which most of the ancient buildings are named: this is supposed to be of the 12th century. Of about the same date is another, called "Mirabilia Romæ,"—or the Wonders of Rome. Both these are full of curious and quaint legends, and are only of secondary authority. On the revival of letters, critics naturally turned their attention to the topography of the city, and several works appeared in succession on the subject. Canina has given a list of more than 120 authors, whose works he had consulted—perhaps the most valuable are those of the celebrated architects, Serlio and Palladio—who have not only written much that is excellent, but measured and delineated the remains of many buildings now swept away, and thus preserved them for our use. The antiquary, Pirro Ligorio, though not much to be depended on in other respects, collected a vast number of sketches of buildings and medals, which are of some assistance in the investigation.

There is one monument of antiquity which has come down to us in a sadly imperfect state, and which, had it been entire, would have been of the utmost value; in fact, it would have decided at once all these questions, as well as many more relating to classic antiquity. It is actually an original plan of Rome, to a large scale, with every house, and, in some instances, every column indicated upon it. The names of most of the public buildings are written in bold, legible characters. It is carved, or rather incised, on white marble, and probably formed the pavement of a temple. Unfortunately the fragments are so broken, that they often tend rather to add to, than to clear up the perplexities of the subject.

It will now be well to bring to your notice the different schools and theories on this subject, and on this point also to correct some misapprehensions. We hear much of Italian and German schools of criticism. Now this is, in some degree, a misnomer; for, though most of the Italians at present hold the opinion of our late Member, Canina, yet some of the Germans (among whom, as a conspicuous instance, I may mention my late valued friend, Dr. Emile Braun), likewise adhere to his opinions. Moreover, the Germans themselves are much divided among themselves. The opinions of Becker and of Bunsen differ materially; as do those of several subsequent German writers. In England a very valuable paper has appeared in Dr. Smith's Dictionary of Classic Geography, under the head of "Roma," from the pen of that excellent scholar, Mr. Dyer. This gentleman agrees with

Canina as to the position of the Capitol, but dissents from his notions as to the Forum. In the last number of the Quarterly Review an attack is made on Mr. Dyer's opinion as to the Capitol; and in a late work the Dean of Christ Church seems to take up the views of Bunsen,—so great are the names, and so various are the opinions connected with this subject. To simplify matters, I will not call them the opinions of the German, Italian, or English schools, but as those of Bunsen, Becker, Dyer, and Canina.

Having given this short sketch of the materials from which our information is derived, let me now direct your attention to the consideration of the site of the Forum, and of the nature of the ground itself.

Rome stands, as is well known, on seven hills, which rise out of a vast plain nearly a hundred miles in length; bounded on the one side by the Apennines, and on the other by the sea. But it is not so well known, except to those who have visited the spot, that these hills are not those gentle rises and rounded forms which we call hills, but are, in fact, precipitous cliffs, separated by narrow vallies, which even now, where circumstances have led to lowering the tops and throwing down the debris into the vallies, are still inaccessible, except at certain points. They are partly of volcanic formation, and partly owe their existence to the action of water. In fact it is not improbable that there have been some vast currents rushing down between the Palatine and Quirinal, which have scarped their faces as they now exist. The two sketches show the ground of the two principal hills, the Capitol and Palatine, as they probably were when first colonized. They are about the height of the cliffs at Hastings; and the steep pathway from the back of Wellington Square up to the Old Castle, will give a very fair idea of the Roman clivus or ascent.

The Capitol, as we see, has two summits with a hollow between, called the Intermontium. Which of these summits was the Arx, and which the Capitolium, has been the subject of most ardent controversy, and will shortly have to be considered.

Without entering into the question as to how far fact and fable may be mixed, it will be sufficient to remind you that Romulus is said to have occupied and fortified the Palatine, and (passing by the stories of Remus) that the Sabines held the Capitol, which was then called (Solinus Polyhistor, 1, 11, 12; Festus 322), Mons Saturnius.

It will now be convenient to follow for a short time the history, or rather the dates of events, and the erection of the various buildings of the Forum, as they occurred.

The first building erected by Romulus was the Temple of Jupiter Stator, on the Palatine. The two armies had engaged in a bitter warfare, and the Romans were driven back, says Livy, to the old gate of the Palatine. Here Romulus rallied them, and drove the enemy back into the low ground, and entirely defeated them; on which he vowed to erect a temple to Jupiter Stator—a vow he afterwards performed—and built it, says Dionysius Halicarnassus, at the Mugonian Gate. Canina endeavours to show, from the nature of the ground, this must have been at the south extremity of the Palatine. But this has no direct bearing on the subject of the Forum, except as proving that the three columns at the upper end could not have been part of the Temple of Jupiter Stator. This must have been on the Palatine, at, or probably within, the Mugonian Gate (whether that gate might have been further up on the Palatine or not.)

At this period, too, the Sacred Way, perhaps the most celebrated road in the world, took its name from the treaty concluded upon it between Romulus and the Sabine king, Tatius. (Dionysius, 246; Festus, 290.) Along this road the sacred offerings to Jupiter were borne to the Capitol by the priests; and thence the Augurs descended to perform their duties in the city.

At this period the Forum became a common place of meeting between the Romans and the

Sabines; the country people resorted there with their goods, and made it a market; but it took no regular form till some years after, under Tarquinius Priscus. Two places, which became much celebrated in after times, were, however, set apart—and these will bear a conspicuous part in our argument.

One was the Vulcanale, or area of Vulcan; a place—as we gather from Plutarch—set apart for the assembly of the judges. The other, and more important one, was the Comitium, or place of assembly for the comitia curiata, or Courts of the Patricians.

Tullus Hostilius erected a building, very important in the history of Rome, the famous Curia Hostilia. Here, says Varro, the senate consulted about human affairs, as they did on sacred matters in the Capitol. The senate also assembled in the Temple of Concord near the Tabularium, and also in the Temple of Jupiter Stator; but the Curia was the proper station. We shall see how different have been the opinions on this as well as the other buildings.

In the reign of Tarquinius Priscus, the Forum first had a definite shape and boundaries. This king, says Livy, first surrounded it with shops and porticos.

The next king proceeded with these different works; the last king, Tarquinius Superbus, completed the Cloaca Maxima, the great main sewer, which ultimately drained the Forum, the works of which were executed by the Etruscans.

We have now run through 243 years of the history of the Forum, and shall rapidly proceed with the important additions which remain. In 246, the Temple of Jupiter Capitolinus was finished. In 257, that of Saturn was completed, and made a treasury by Valerius Poplicola. In 270, after the battle of Lake Regillus, the legend so beautifully related by Livy, and versified by Macaulay in our own time—at the spot where the Twin Brothers gave water to their horses at the Fountain of Juturna, a temple was erected to Castor and Pollux. In 305, another incident—also sung by the same poet—the tragic death of Virginia, took place: this occurred under the new shops, close to the Shrine of Cluacina.

Sixty years afterwards came the Gauls, and destroyed everything they could, leaving Rome such a ruin that the inhabitants were nearly quitting it in despair and removing to Veii. Through the exertions, however, of Camillus, the city rose again from its ashes, and, in memory of the event, he founded the Temple of Concord, between the Capitol and the Forum (says Festus, voce Senaculum), and close to that of Saturn (says Servius, in his Commentary on the 2nd Æneid). In 410, the Temple of Juno Moneta was built upon the Arx, where the house of Manlius stood. In 449, a small bronze shrine to Concord was erected in the area of Vulcan, by C. Flavius. In 536, a temple was erected to Concord in the Arx, near that of Juno Moneta, according to the vow of Manlius. In 542, Livy records a great fire, which burnt the old shops, the Atrium Regium, the Fish Market, and much other property. At that period, the historian remarks, there were no basilicas. Very shortly afterwards the first of these remarkable buildings was erected, and that by the last man to be suspected of a wish for innovation—the famous Marcus Porcius Cato. He bought, says Livy, two large halls from Manius and Titius, in the Lautumiis (or as Canina supposes, in the Lantulis), and four shops for the public; and there he built the Basilica, which is called the Porcian.

Two or three years after this was finished, the celebrated poet, Plautus, died at Rome. He is the first writer who mentions a basilica, and he does so twice. Once, in the "Captives," he speaks of the smell of fish in the Fish Market, which was so strong that it drove the people out of the basilica into the Forum—which circumstance of course proves its contiguity to it—and next, in a passage so extremely curious, that I venture to attempt a translation of it. Though it is somewhat difficult, and in some parts obscure, it is so graphic a description of the Forum of his day, that my paper would hardly be complete without it. It is in the play called the Curculio. The fourth act commences with a speech of the Choragus, who is supposed to be standing alone, gazing at the Forum, and thus soliloquizes:—

> "And now I'll show you in what place to find
> A man of ev'ry sort you'd wish to seek:
> And no great trouble to me; look you round
> For good or bad, modest or impudent.
> You want to find a hireling perjurer?
> I send you straight to the Comitium.
> A lying braggart?—Cluacina's fane!
> Poor devil husbands? Under the Basilica
> You'll find them, where the spanking girls resort,
> Ready to bargain with you: then, for gluttons,
> Who club together for a savory lunch,
> Go to the Fish Market: and down below,
> Right at the very bottom of the Forum,
> Walk your good men—your wealthy citizens.
> Then in the middle, close by the canal,
> Those who show samples of the purest wines:
> Above the Lake, the chattering backbiters,
> Relating slanders vile of other people,
> That might be truly published of themselves.
> Under the ancient shops, the fools who borrow,
> And the hard rogues who thrive on usury:
> Behind the Fane of Castor there are men—
> Don't you believe them easily! and there,
> In the Etruscan Street, a sort of Fellows
> Who'd sell their very selves to turn a penny.
> In the Velabrum there are bakers, butchers,
> Or fortune tellers; cheats or cheated all,
> Each in their several turns,—but hark! the door
> Creaks on its hinges; I must hold my tongue."

The erection of this basilica was speedily followed by others.

In 622, after the slaughter of the Gracchi, Lucius Opimius, who was the principal agent in that tragedy, built a temple to Concord in the Forum—as we are told by Appian and Plutarch. He also built a splendid basilica, which we may suppose, from a passage in Varro, to be near this temple. In 631, the Arch of Fabius—the first triumphal arch erected in the Sacred Way—was built, in honour of the victory of Fabius Maximus Allobrogicus over the Allobroges. As to the position of this arch there are also great disputes. In 652, the Tabularium was built by Q. Lutatius Catulus: on this there is no dispute, thanks to an inscription which existed there a short time ago. In 699, the Basilica Æmilia was built by Lucius Æmilius Paulus, with columns of Phrygian marble. In 702, the Curia Hostilia—which had previously undergone some alteration by Sulla—was burnt, together with the Basilica Porcia, by the mob at the funeral of the Demagogue Clodius. The fire reached as far as the Comitium, and injured the statue of Attus Nævius.

We now come to the time of the Dictatorship of Julius Cæsar, who, finding the Forum too small, commenced a new one, with a temple to Venus Genetrix. He then began the Basilica Julia, the position of which was first suggested by Canina, and has since been clearly determined by an inscription. He also commenced the Curia Julia, which Pliny says was on the Comitium, and Dion Cassius, near the Comitium. These works were finished by Augustus, who also built the Forum, which bears his name, with the Temple of Mars Ultor, the Temple of Julius Cæsar, and several other works.

I have now run quickly through an account of the principal buildings with their dates, a course which is almost absolutely necessary in order to make the rest of my subject intelligible. Those on which I have touched hastily will be more particularly described as we come to them.

We now see that the only buildings about which there is no doubt, are the Temple of Antoninus and Faustina, which bears its name on the front, as also does the Arch of S. Severus. The Tabularium was so inscribed in the days of Poggio. The Mamertine Prison is without doubt the old prison, from its structure, the unvarying tradition attached to it, and the inscription recording its restoration. The huge arches formerly called the Temple of Peace, are clearly those of a basilica, not of a temple; and as the Regionary describes a basilica of Constantine as standing near the Temple of Venus and Rome, we may reasonably conclude this to be the building. So far the learned are agreed. Beyond this all is matter of dispute. The three great points in this controversy, on which in fact most of the minor ones turn, are, Where were the Comitium and its adjacent buildings? What are the temples under the Capitol? which was the Arx, and which the Capitolium, on the two summits of the hill? The Comitium, as has been stated, was the place of assembly for the Curia Comitiata, or patrician assemblies, the Plebs usually assembling in the Campus Martius. Livy mentions an occasion when it was covered, "the first time," he says, "since Hannibal departed from Italy." This would seem to prove it was an open place; it was raised a few steps and had statues on it, those of Pythagoras and Alcibiades are specially mentioned on the horns or corners of the Comitium; there was also a statue of Attus Nævius, the augur, the base of which was injured by the fire at Clodius' funeral. Pompeius Festus mentions "the Vulcanal which is above the Comitium;" and Asconius, in a Commentary on Cicero's Speech for Milo, says, "the Rostra were not then where they are now, but at the Comitium nearly joining the Curia." Let us investigate what these places were, and first the Vulcanal or Area of Vulcan. This was an open place sacred to Vulcan, not a temple (for the temples to Vulcan were always outside the walls), and from a passage in Plutarch, it appears it was used for assembling the judges. Dionysius of Halicarnassus says it was a short distance from the Forum. Livy says the statue of Horatius Cocles was on the Comitium; but Aulus Gellius and Plutarch say it was in the Vulcanal. Livy also, relating the prodigies which took place before a great pestilence, says it rained blood in the Area of Vulcan and of Concord. Let us next enquire what the Grecostasis was. Varro tells us it was a "locus substructus," a raised place, a platform or terrace on the right of the Comitium, where the ambassadors of foreign nations waited till they could be received by the Senate. It was probably originally of wood; for in the Imperial times, as we learn from the Catalogus Imperatorum, the Senate, the patrimony of Cæsar, the Basilica Julia, and the Grecostasis were burnt down. It was rebuilt, says Julius Capitolinus, by Antoninus Pius, and then (from the fragment of the Capitoline Plan) it appears to have been a regular building, with a flight of steps, and a hexastyle portico in front. But as we pursue our enquiry, we find other buildings again adjacent to them are mentioned. Varro says in another passage, "there is the Senaculum above the Grecostasis, where there is the Temple of Concord and the Basilica Opimia." Now, we have shewn this Temple of Concord to have been built by L. Opimius after the slaughter of the Gracchi in 622, and that it is not likely to be the temple built by Camillus at the foot of the Capitol in 387. So that it is quite clear, that the Comitium must have had above it (and immediately adjoining the Grecostasis,) the Area of Vulcan, the Temple of Concord, the Rostra, and the Curia. Besides this the Basilica Porcia could not have been far off, for when it was burned the Curia was consumed, and the fire must have reached the Comitium, for the base of the statue of Attus Nævius was injured.

Now, Canina has arranged all these buildings on the *south side.* He considers the Comitium to have extended along nearly all that side of the Forum, above this was the Curia, in front of which was the Grecostasis, and the Area of Vulcan; above these again, the Basilica Portia, the Temple of Concord of L. Opimius, and the Area of Concord. All these, as you will see, fall into their proper places extremely well. But his opponents place them on the *north side,* and they justify themselves chiefly by two very curious passages in Pliny. The first relates to the method of finding and proclaiming noon-day at Rome, which was done to give uniformity of time to the city, there being no clocks, and probably was looked to just as at present we look to see the ball dropped by means of the electric telegraph. He says, it was done "when from the Curia the sun was seen between the Rostra and the Grecostasis." Therefore, say both the Germans and Mr. Dyer, the Curia must have stood on the north side of the Forum so as to face the south, or the sun would not be seen at noon-day. The next passage is also in the Natural History of Pliny, that a lotos said to have been originally planted by Romulus, and cöeval with the city itself, and which stood on the Vulcanal, had extended its roots and penetrated through the Stationes Municipiorum (or sentry boxes of the guards), "in forum usque Cæsaris," *i.e.* as they translate it into the Forum of Cæsar. If then, say they, the Vulcanal was were Canina has placed it, how could the roots run quite across the Forum to the opposite corner, or nearly half a quarter of a mile.

Another point of objection to Mr. Dyer's theory is, that he places the Comitium upon the Forum itself, making it in fact part of the Forum. In more than one passage of Livy, he says, relating his prodigies in the usual way "*in foro et comitio sanguinis guttæ,* &c." It rained blood in the Forum and in the Comitium. He would hardly have used this expression had one been part of another. But there seems to be one simple fact utterly destructive of Mr. Dyer's views, and that is that the area of Vulcan is placed in the fourth region, and not in the eighth, or, as we might say, in Bishopgate Ward instead of Broad Street Ward. There can be no mistake about it; the Notitia, the Curiosum Urbis, Publius Victor, and Sextus Rufus all agree, and if there be any reliance to be placed on their general testimony, Mr. Dyer's theory must fall to the ground at once. The plans of Becker and Bunsen are very similar, they both place the Comitium above the Forum at its East end, the chief difference being its length. They also place the Vulcanal and Curia on the North side. Bunsen puts the Rostra and Grecostasis on the Comitium; Becker places the latter on the North side. There are several minor differences which we will not now stop to inquire into. The chief objections however to the plan of Bunsen, which in other respects is very ingenious, is the situation of the Via Sacra, which he places on the North side, and makes it pass close in front of the Temple of Antoninus and Faustina (Becker makes it turn abruptly there at a right angle). Now it is impossible that it could have passed in front of the temple, for even so late as the days of Palladio there was before the temple a large enclosed court, atrium, or τεμενος, which extended across nearly to the other side of the Forum. Palladio took careful plans of it, which he has published with all the details; no one surely would have ever ventured to block up the sacred way or to divert it, and this must have been the case if Bunsen's plan is right—besides it would have rendered the arch of Fabius useless, which was not the case; for we know from a passage in Trebellius Pollio, speaking of a statue of Saloninus, that it was "at the foot of the mountain of Romulus (the Palatine), that is (he says) before the sacred way, between the Temple of Faustina, and turned towards the arch of Fabius." Quite as unlikely also is it that there should be two abrupt turns in the sacred way, and those made to avoid the two most sacred temples, the Vesta, and the Castor and Pollux; the more especially as the scholiast in Cicero speaks of those going in the sacred way "*post templum Castoris.*"

Let us now return to the objections made to Canina's views which were stated before, but left for future examination. First, as to observing the sun between the Rostra and Grecostasis from the Curia. Surely Becker could never imagine that his plan satisfies this condition? There is an angle of at least 60 deg. from the steps of his Curia between his Rostra and Grecostasis. It is less, it is true, in Bunsen's plan, but in neither plan, as I believe, could any eye mark the time of noon to half an hour. Now Canina's idea is, that the observer stood on the steps of the Curia with his back to the sun, and observed when the shadow of some object arrived at a line exactly midway between each, and he justifies this by the very same passage in Pliny, only reading the very next sentence, which shows how they marked the hour of sunset—namely, when the shadow thrown by the column of Mænius fell on the prison. If this view be correct, the Curia must have been on the South side facing the North, or the shadow could not have been seen at all. It must of course have fallen behind the temple behind the back of the observer. But a still more complete answer may be given as to the plant whose roots ran to the Forum of Cæsar. I think it is an error in the translation; "radices ejus in forum usque Cæsaris—per stationes municipiorum penetrant"—must be rendered "its roots penetrate into the forum as far as Cæsar's"—[what? clearly] Cæsar's Temple, the Temple of Julius, which, we shall shew presently, stood in the middle of the top of the Forum looking direct at the Tabularium. It is the same phrase as "habitabat Rex ad Jovis Statoris" of Livy, or the "limina post pacis" of Martial.

To be Continued.

ON FURNITURE, ITS HISTORY, AND MANUFACTURE.

By J. G. Crace, Esq., Contributing Visitor.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, March 23rd, 1857.

When a nation has made a certain progress in the arts it naturally seeks to adorn the ordinary articles of daily use, and to render them more convenient and elegant; so that out of a state of rude deformity they at last become objects of beauty and luxury—thus from a rude clay cup have been developed the precious vases of Etruria—and thus did refinement mark its growth on the bronze implements of Herculaneum and Pompeii.

Of the furniture of ancient times we possess but few specimens. We are told by Wilkinson that the Egyptians displayed considerable taste in the furniture of their houses; studiously avoiding too much regularity, they preferred variety both in the arrangement of the rooms and in the character of the furniture. Their mode of sitting on chairs resembled that of modern Europeans rather than of Asiatics; nor did they recline at meals like the Romans, though couches and ottomans were to be found in an Egyptian as they are in an English drawing-room. Many of the fauteuils were made of most elegant forms in ebony and other rare woods, inlaid with ivory. The legs were mostly in imitation of those of animals, but some had folding legs like our camp stools. The back was light and strong, consisting of a single set of upright and cross bars, or of a frame receding gradually and terminating in a graceful curve, supported from without by perpendicular bars. Over this was thrown a handsome pillow of coloured cotton, painted leather, or gold and silver tissue. The couches evinced no less taste than the fauteuils, and were of wood, with one end raised and receding in a graceful curve. The British Museum contains examples of chairs in ebony inlaid with ivory, of a kind of citron wood inlaid with dark wood and ivory, and an X chair likewise inlaid; all of which show the degree of perfection to which the Egyptians had attained. These inlays are made by veneering just as at the present day.

The paintings on the Etruscan vases supply us with numerous examples of the furniture used by the Greeks, showing with what elegance and simplicity of form they were designed. Judging from the tasteful folds of their garments and the pure ornamentation that enriched them, we may suppose that the furnished interior of a Greek house harmonized with the cultivated taste which fostered and applauded the works of Phidias and Apelles. The sketches, traced from examples on these vases, represent chairs which have served as models at the present day. The late Mr. Rogers had a set made from a bronze example in his own possession, but which is now in the British Museum.

Of the furniture of the ancient Romans we are enabled to speak with more certainty, as we possess a greater number of specimens, which the discovery of Herculaneum and Pompeii has brought to light. Less tasteful but more luxurious than the Greeks, their furniture was remarkable for richness rather than for purity of design. They had furniture in bronze and iron, and in precious woods inlaid with ivory and pearl; they had costly and beautiful stuffs richly embroidered with elegant designs; and their houses were decorated with such taste, that the remains taken from these two provincial towns excite the admiration of the most cultivated minds.

A passage in the 16th Book of Pliny's Natural History gives the following interesting illustration of our subject.

"The best woods for cutting into layers and employing as a veneer for covering others, are the citrus, the terebinth, the different varieties of the maple, the box, the holly, the holm oak, the root of the elder, and the poplar. The elder furnishes also, as already stated, a kind of tuberosity which is cut into layers like those of the citrus and the maple. In all the other trees the tuberosities are of no value whatever. It is the central part of trees that is most variegated, and the nearer we approach to the root the smaller are the spots and the more wavy. It was in this appearance that originated that requirement of luxury which displays itself in covering one tree with another, and bestowing upon the more common woods a bark of higher price. In order to make a single tree sell many times over, laminæ of veneer have been devised; but that was not thought sufficient—the horns of animals must next be stained of different colours, and their teeth cut into sections, in order to decorate wood with ivory, and, at a later period, to veneer it all over. Then, after all this, man must go and seek his materials in the sea as well! For this purpose he has learned to cut tortoise-shell into sections; and of late, in the reign of Nero, there was a monstrous invention devised of destroying its natural appearance by paint, and making it sell at a still higher price by a successful imitation of wood."

"It is in this way that the value of our couches is so greatly enhanced; it is in this way, too, that they bid the rich lustre of the terebinth to be outdone, a mock citrus to be made that shall be more valuable than the real one, and the grain of the maple to be feigned. At one time luxury was not content with wood, at the present day it sets us on buying tortoise-shell in the guise of wood."

In the 13th Book Pliny speaks of the mania for fine tables. He says "There is preserved to the present day a table which belonged to M. Cicero, and for which, notwithstanding his comparatively moderate means, he gave no less than one million sesterces (£9,000). Two tables were also sold by auction which had belonged to King Juba, the price fetched by one was one million two hundred thousand sesterces." A library discovered in a ruined villa near Portici was adorned with presses inlaid with different sorts of woods. The beds were often made of cedrate enriched with inlaid work, &c., and a bed made of iron has been found at Pompeii.

In all these specimens of Egyptian, Grecian and Roman workmanship, it will be noticed that though the peculiarities of the style are distinctly preserved, they have no architectural character, but simply constructive forms and beauty of outline adapted to the material used.

We have now to pass through a dark cloud which obscured every phase of art; we pass over a period of more than a thousand years. According to Greek manuscripts of the tenth century, the decoration of furniture in the Eastern Empire must have been of considerable richness, as the thrones, seats, and beds represented, though rude and ungraceful in form, are highly decorated with gilding and inlaid work. Theophilus the Monk, in the twelfth century, tells us that, not satisfied with decorating the smooth parts of furniture with colour, they painted on it figures, animals, and foliage, sometimes on a gold ground. The same writer in his Essay on Various Arts, chap. xvii, thus describes the manner of preparing panels for painting on: "You must join the boards with care, piece by piece, by the help of the instrument used by carpenters and joiners, you must fasten them with glue; the panels brought together by this glue, when they are dry, adhere so solidly that they cannot be separated either by damp or heat. They must then be made smooth with an iron proper for that purpose; this iron, curved and cutting on the inside, is provided with two handles in order that it may be used with two hands. It serves to plane the panels and the doors so that these objects become perfectly smooth. You must then cover them with the hide, not yet tanned, either of horse, ass, or ox. After having macerated it in water and scraped off the hair, the excess of water is pressed out of it. It is applied to the wood in this damp state with the glue of cheese." In another chapter he explains the manner of covering these panels, lined with leather, with a light coat of plaster or chalk; he takes care to recommend the use of linen cloth or canvass if no skin is to be had; he afterwards gives the process of painting these panels in red or any other colour with linseed oil, and covering them with varnish.

The beautiful altar frontal in Westminster Abbey is a most interesting example of the process described by Theophilus, and it is of a period not far removed from his time.

We now enter upon a style of art founded upon principles altogether different from those which preceded it—the Mediæval. In that chivalrous era the tournament and the battle field were the predominating objects which engaged the attention of the many, and the study of literature and the practice of art were confined to the Church alone. The Crusades had, however, opened to Europeans a knowledge of the arts that still flourished in the East, and had probably material influence on the principles of Mediæval design. Our forefathers of the thirteenth, fourteenth, and fifteenth centuries, lived in a rude convivial manner which demanded few luxuries of furniture, and these at the earlier parts of that period were sufficiently plain and simple in form, depending rather on their painted decoration than on neat workmanship or carving; this taste, however, towards the end of the fourteenth century gradually changed, and colour gave way to more finished workmanship, moulded panels, and carved ornaments. The construction of the furniture thus became better suited to the material employed. On rejecting the covering of parchment, it was necessary to arrange the wood in smaller compartments to prevent it splitting or casting; hence arose the system of panelling and framing, which became the main feature. One of the chief beauties, however, of the furniture of this later time was the elegant metal work applied in the form of locks, hinges, handles, &c. Many of these still remaining show wonderful perfection and taste in the workmanship. I will not attempt to particularize the peculiarities of style of the various periods, but I will now describe the principal articles of furniture belonging to a house of that time. The great dining hall had a long table at the end, at which the lord and his principal guests sat; two other tables for inferior visitors and retainers were placed along the sides of the hall at right angles with the upper one; tables so placed were said to stand banquet-wise. The lord's seat was distinguished by a canopy, or "cloth of estate," on which was generally displayed his coat of arms, and a cloth of tapestry was hung against the wall. This end of the hall being raised above the rest was called the "high dese" or dais; the step forming a line of demarcation beyond which none were to approach except by invitation. Sometimes the tables were arranged in one length, in which case the salt cellar formed the boundary between inferiors and the more honoured guests. The floor was generally strewed with rushes. The tables were massive boards fixed on trestles morticed into the floor. The seats were mostly forms, but chairs were sometimes used. A MS. of the fourteenth century has this item:—"To put wainscote above the dais in the king's hall, and to make a fine large and well sculptured chair." At the further end of the hall a cupboard called the "Court cupboard" was generally placed, in which the service of plate, such as salvers and gold drinking cups, was arranged on shelves or stages, answering in some respects to the sideboards of the present day. These cupboards, though originally of rude construction, afterwards became elaborate and beautiful pieces of furniture richly carved in oak; they are often alluded to in old documents. On grand occasions temporary stages as cupboards were also erected. At the marriage of Prince Arthur, son of Henry VII, in the hall was a triangular cupboard, five stages high, set with plate valued at £1,200. entirely ornamental; and in the "utter chamber," where the princess dined, was another cupboard "set with gold plate, garnished with stone and pearl, valued at £20,000."

In the inventory of Skipton Castle, in Yorkshire, the furniture of the great hall is thus given—"Imprimis, 7 large pieces of hangings, with the Earl's arms at large in every one of them, and powdered with the several coates of the house. 3 long tables on standard frames, 6 long forms, 1 short ditto, 1 Court cupboard, 1 fayre brass lantern, 1 iron cradle with wheels for charcoal, 1 almes tubb, 20 long pikes."

The great chamber was often used as a sleeping room by night and a reception room by day.

Shaw, in his decorations of the Middle Ages, gives the interior of a chamber in which Isabella of Bavaria receives from Christine of Pisa her volume of Poems. The Queen is seated on a couch covered with stuff of red and gold, and there is a bed in the room furnished with the same material, to which are attached three shields of arms. The walls of the chamber were either hung with tapestry, or painted with historical subjects. Chaucer in his Dream fancies himself in a chamber—

"Full well depainted,
And al the walles with colors fine,
Were painted to the texte and glose,
And all the Romaunte of the Rose."

The floors, which at an early period were laid with rushes, were at a later one covered with a carpet of English or Turkey work. The description of the furniture in the great chamber at Hengrave, the seat of Sir Robert Kytson, temp. Henry VII, enumerates very minutely the various articles; among which are, a long carpet, tables with several coverings, cupboards, chairs, stools, two great chairs, silk and velvet coverings, cushions, curtains to the windows and doors, a great screen, fire irons, branches for lights, &c.*

There is no mention of a mirror, but they were used at this time, though very small, and were of metal polished. The coffer or chest which contained the lady's trousseau, was subsequently much ornamented. The wardrobes, so called, were generally small rooms fitted with cupboards called armaries. In 1253, "the Sheriff of Southampton was ordered to make in the King's upper wardrobe, in Winchester Castle, where the King's cloths were deposited, two cupboards or armariola,† one on each side of fire-place, with arches and a certain partition of board across the same wardrobe.

There were also tables of cyprus and other rare woods, carved cabinets, desks, chess-boards, and above all the bed — the most important piece of furniture in the house, of which Ralph, Lord Basset said, "Whoever shall first bear my surname and arms, according to my will, shall have my great bed for life." There was the "standing bed," and the "truckle bed;" on the former lay the lord and on the latter his attendant. In the day-time the truckle bed, on castors, was rolled under the standing bed. The posts, head-boards, and canopies or spervers of bedsteads, were sometimes carved, or painted in colours; but they are generally represented covered by rich hangings. King Edward III. bequeathed to his heir "an entire bed marked with the arms of France and England;" and Richard, Earl of Arundel, to his wife Philippa, "a blue bed, marked with his arms, and the arms of his late wife;" to his son Richard, "a standing bed, called clove, also a bed of silk embroidered with the arms of Arundel and Warren;" to his son Thomas, "his blue bed of silk embroidered with griffins, &c., &c."

The chair was a single seat without arms. The fauldstuel (fauteuil in modern French), was originally a folding stool of the curule form, but afterwards the form alone was preserved; examples remain from the time of Dagobert to a late period. Dagobert's Seat is considered by some to be of much greater antiquity than his time, and the back and arms are certainly of a later period than the rest. The so-called Glastonbury Chair is much to be commended for simplicity of form, perfect strength, and adaptation for comfort. In the earlier times chairs and benches were not stuffed, but had cushions to sit upon, and cloths spread over them; afterwards, as the workmanship improved, they were stuffed and covered with tapestry, leather, or velvet. The forms and workmanship of these seats were generally very rude, but the stuffs that covered them were of great richness and value, and tastefully trimmed with fringes and gimps, fastened with large brass studs or nails.

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* Vide Hunt's Tudor Architecture; a work from which many of these details of Mediæval Furniture are extracted.

† *Fr:* Armoire.

We now arrive at a period when the taste for classic literature led to the study of the arts associated with it, and produced the style of the Renaissance. Then appeared those great artist minds, Raphael and Michael Angelo; while the demand for articles of luxury called forth the genius of Cellini, Palissy, Jean Goujon and Germain Pilon. I think it is generally agreed that the Italians were the first to apply themselves to the manufacture of ornamental furniture of the more modern style. They adopted in their cabinets architectural forms, which they enriched with a superabundance of ornament, figures, inlaid marbles, &c., but so elegantly disposed as to make us forget the want of constructional character. Giuliano, son of Baccio d'Agnolo and his brothers Filippino and Domenico, are particularly mentioned by Vasari as the most talented sculptors of furniture in the middle of the sixteenth century. Marquetry was revived and applied to the decoration of furniture. Vasari names among the most skilful in this art in the fifteenth century Giuliano da Maiano (1460), Giusto and Minore who assisted him, and Benedetto da Maiano who excelled in the process of conjoining woods tinted of various colours, and thus representing buildings in perspective, foliage, &c. In the sixteenth century he mentions Fra Giovanni da Verona (who had a high reputation), Fra Raffaelle da Brescia, and others. This furniture was highly esteemed throughout Europe, and Vasari relates that Benedetto da Maiano made two magnificent coffers in marquetry for Matthias Corvinus, King of Hungary, but on taking them to him, he was distracted at finding, on unpacking them, that the damp weather had softened the glue, and that all his beautiful marquetry was detached from the work.

The large trousseaux chests, or coffers, of this period are remarkable for the richness and excellence of their sculpture; they were made principally for marriage gifts, and the talent of the first artists was employed upon them. The design of the work can scarcely be considered appropriate, as it bears characteristics suitable for stone rather than wood.

In the latter part of the XVIth century, the Germans had arrived at considerable renown for excellence in the manufacture of furniture—both in carved work and marquetry. More especially celebrated were those art cabinets (kunst schränke), of which many are still preserved in European palaces and collections. Adopting generally the design of an architectural façade, they combined in them all that was rich in materials and excellent in art—ebony, ivory, tortoiseshell, amber, lapis lazuli, jasper, and even gems were used by the painter, the goldsmith, the sculptor, the enameller, the workers in marquetry and mosaic, to produce conjointly these truly named art cabinets. The manufacture was principally carried on at Nuremberg, Dresden, and Augsburg. There is a fine specimen in the Green Vault at Dresden, which bears the name of Hans Schuferstein of Dresden; a desk which accompanies it is dated 1568; another cabinet in the same collection bears the name of Kellerthaler, a goldsmith of Nuremberg, and is dated 1585. One of the choicest examples is to be seen in the Royal Palace at Berlin; it was made at Augsburg in 1616, for the Duke of Pomerania, having been designed by Philip Hainhoff, and executed by Baumgärtner. Hans Schwanhard, another eminent cabinet maker, who died 1621, invented the undulating ebony mouldings introduced in cabinets of that time.

In France, through the efforts of Francis I. the arts made great progress in the XVIth century. He induced many celebrated Italian artists, as Primaticcio, Giulio Romano, Benvenuto Cellini, and many others, to settle in France, and laid the foundation of that taste which has since taken such deep root. Less celebrated than the Italian, French cabinet work yet arrived during the XVIth century at great perfection. Bachelier, a celebrated architect and sculptor of Toulouse, said to be a pupil of Michael Angelo, applied himself to cabinet work, and acquired great reputation. A cabinet in the Soulages Collection is said to be by this artist. The celebrated wood sculptor, Jean Goujon, disdained not to apply his talent to this branch of art. Marquetry also was much employed by the French at this time. I have alluded hitherto to the artistic furniture of the period which was required for ornament rather than use, and could be purchased only by the very wealthy. The commoner articles of house furniture were still of a rude and simple character—good tools and clever workmen being scarce. The chairs were generally of the ordinary curule shape, of which there are several specimens in the Soulages Collection, some being of simple wood, others inlaid; there were also square chairs, with square stuffed backs—all rather rude in make, but sometimes covered with extremely rich stuffs, handsomely trimmed with fringes, &c.

Towards the end of the sixteenth century the Renaissance lost its earlier tastefulness, and especially in Flanders, assumed a bolder but coarser character. The furniture was picturesque, but had lost the qualities of purity of design. The chairs were much altered in form, the legs were turned, either plainly or spirally, the backs sometimes high and richly carved: as furniture of a showy kind was more generally used, the carving became of a coarser and commoner description.

The reign of Louis the Fourteenth of France introduced considerable alterations in the arts—richness and grandeur took the place of the purer style of the Renaissance. For the palaces built by Mansart, where Le Notre designed the gardens, and Le Brun decorated, it was necessary to have furniture to correspond with the splendour of all around. It was at this time that the celebrated Buhl or Boule was employed to make the cabinets that still bear his name. André Charles Boule, was born at Paris in 1642. His first ambition was to become a painter, but he at last settled to the business of his father, a cabinet maker, and the superiority of his works attracted the favour of the King, who granted him apartments at the Louvre, and named him "Premier Ebéniste de sa Maison." He then commenced the grand series of cabinets and other furniture for the palaces of the King and his courtiers: what particularly distinguished these, was the kind of marquetry in tortoiseshell and metal which was invented by Boule, and is still called after him. Although out of the bounds of strict taste, there is yet abundant genius in the works of this master. The patterns of his inlay work are full of fancy and beautiful drawing, and his gilt metal mountings, though detached and apparently unconnected, form a magnificent and harmonious whole. His grand inkstands and incidental furniture show wonderful talent in their flowing curves and harmonious ornaments. The genius of Boule is best understood by comparing him with his successors. Notwithstanding the richness, there is a sobriety in the ornamentation of his works, while in Crescent and others of his imitators, there is too much disposition to profusion of ornament. Another man of great talent in designing furniture and ornaments for inlay work, was Berain, who was also attached to the Royal factory.

During the reign of Louis XIV. the arts were much encouraged; his minister, Colbert, saw their importance, and though a Chancellor of the Exchequer, he was bountiful in founding schools for the instruction of workmen in drawing and knowledge of art, and in fostering that school of manufacturing art, the tapestry works of the Gobelins; this and the royal manufactory of porcelain at Sevres, in executing works of the highest artistic perfection, raised up a class of skilled designers and art workmen, who disseminated the knowledge they had acquired in these royal factories. Under Louis XV. furniture lost its grandiose character and became more remarkable for prettiness; the forms rounded or curved became more eccentric; the ornaments assumed the peculiar style called Rococo, which is founded on a system of reversed scrolls and shell-work producing undulating forms, not ungraceful in the hand of a master, but of dangerous facility of execution, and the curse of the common ornamental furniture of the present day. A taste for marquetry in woods was revived, and to such an extent was it used, that it sometimes covered the whole of a piece of furniture. The chairs of this time were very gracefully formed in the style called the Cabriole, in which there is no fixed form but continuous curved lines. As ease and luxurious comfort were essential considerations, the upholsterer's art of stuffing became an important aid in carrying out these desiderata. Beauvais tapestry of a very beautiful description, representing flowers, animals, trophies, or pastoral subjects, was also applied to furniture.

In the time of Louis XVI. a fresh style of ornamentation arose, which is now known by that monarch's name. It resembled the Renaissance in its ornaments, but had nothing of its artistic genius; and it mingled delicate foliage and ribbons and roses with the attributes of Corydon and Phillis. The furniture of this period is remarkable for the elaborate finish of the ornaments, the constructive forms being simple and generally without curves. Marquetry work in France appears to have reached its perfection of finish at this time. Reisner, David Reintientz, a native of Neuwied, and Gouthier, were eminent cabinet makers, and celebrated for this kind of work. Reisner was remarkable for his peculiar and beautiful inlay of flowers, the leaves of which were shaded by heat. David Reintientz produced the shades of his marquetry solely by the natural colours of the woods; nothing can exceed the extremely fine jointing of the parts of the marquetry by these two masters, nor the taste and perfect finish with which the various woods are combined. Gouthier was celebrated for the exquisite taste and elegance of his metal works, producing groups of foliage and flowers which rivalled nature in the perfection of their design and workmanship; this artist was, I believe, the inventor of "or-mat" in metal work. David made the meuble de noce of Marie Antoinette, and Gouthier one for the Comte D'Artois on his marriage. The chairs and sofas of this period had lost the graceful curves of the former reign, and a stiff straight style was adopted, which was however relieved by the infinite delicacy of the ornamental carving.

The Revolution in France, especially during the reign of terror, must have either ruined or caused to wander abroad most of the art workmen, and for a long period a style of art obtained which was a very poor copy of the classic; this under Napoleon I. was modified into the so-called style of the Empire, founded on the works of Percier and Fontaine, two celebrated architects; but though any style carried out by clever men may have a certain merit, there is little in this to interest or instruct. The furniture of this period was made principally of mahogany, with little if any carving, the ornamentation being given by bronze work of a very flat and meagre character.

During the reign of Louis Philippe, French art changed very considerably, and sought for models in the Renaissance period. The periodical exhibitions of national products, by causing emulation among the manufacturers, produced a higher class of art workmen, and by the beauty of the works executed, caused a great demand for them. May these words of the celebrated Necker ever be borne in mind by our Chancellors of the Exchequer, "Le goût est le plus adroit de tous les commerces," which may be rendered thus—"That no kind of commerce has such skilfulness in increasing the demand for manufactures, as taste." The art of marquetry, which had lain dormant since the Revolution, was revived, and wood carving, as applied to art manufacture, arrived at a very high state of perfection.

In speaking of the furniture of various countries since the Renaissance I have not alluded to our own, but as England had not exhibited any peculiar excellence in this manufacture, I thought it better to carry on the explanation of the successive styles through those countries which particularly influenced them. While the Renaissance supplanted the Gothic in France, Italy and Germany, our own country adopted the Tudor style, till that was changed into a coarse kind of cinque cento work named the Elizabethan; this continued with various modifications till the works of our celebrated countryman Inigo Jones, induced a taste for Italian art. The carved oak furniture of the time of Elizabeth and James the First, is marked by rather exaggerated forms, particularly in the turning, as instanced in the bed of Ware and that from Cumner Place, illustrated in Richardson's work on Old

English Mansions. The tables and buffets too, where turned work is introduced, present the same features; the friezes and panellings have either scroll work or that particular kind of ornament called strap work; various specimens of furniture of this period and the next century remain at Penshurst, Knowle, Hardwicke Hall, and Holland House. Towards the time of King William and Queen Anne, the style greatly changed, assuming more of a bold Florentine character, but taste seems then to have declined till the time of George the 3rd, when I think it reached its lowest point—a compound of Strawberry Hill Gothic and Chinese being considered the most fashionable style. Mayhew and Ince, Cabinet Makers, published in 1750, a work of specimens in this style, and Chippendale, another manufacturer, and an able man, also published a collection of designs. It was a grand step to work away from these false ideas of ornaments, and resume a quiet simple style distinguished by good workmanship and pure taste; this was achieved by our cabinet makers early in this century. During the last forty years art has grown up gradually amongst us, until we perceive the full importance of encouraging it; above all, competition with foreign countries has taught us to know our own deficiencies.

I will now say a few words respecting the manufacture of furniture: it will not be possible to give a full description of the various details, but an account of some of the ornamental processes may be of interest.

It is essential for good cabinet work that the wood employed be thoroughly seasoned,—far more so than for joiners' work. Except in wainscoat furniture, almost all of it has, in some part or other, to be veneered; the handsomer qualities of wood being too expensive for use in the solid, and also not so likely to stand as when laid on a wood of a plainer kind. The ground generally used for this purpose is Honduras mahogany. Veneer is wood cut into sheets, about one-sixteenth of an inch thick, by saws contrived for that purpose. The wood from which these veneers are cut sometimes fetches an extraordinary price. The ornamental knotted-looking walnut wood, now so much used, is a burr of the tree, or a swelling, generally near the root. The woods most frequently used for veneering are, the fine kinds of mahogany, rosewood, satinwood, birds'-eye maple, walnut, tulip wood, and amboyna. The ground, having been prepared of the required form, is finished with a toothed plane on the side to be veneered, and the veener itself is also planed in the same way. The wood is first soaked with water, then the sheet of veneer is well dried, and afterwards both it and the ground are spread over rapidly with glue, and the two parts are brought immediately together; when joined, it is at once covered with a heated caul, either of wood or metal, and afterwards a number of screws are applied, so as to press the parts together in every direction.

Marquetry, or the inlay of various woods, is one of the most beautiful processes in cabinet work. The design, having been first drawn on paper and properly coloured, is pricked with a fine needle, so that the outline of the ornament can be pounced on the various coloured woods proposed to be employed. These outlines, being carefully marked in, are cut with a fine watch-spring saw. In most cases the wood forming the ground is cut with that of the ornament; so that a piece cut out of white wood corresponds exactly in shape and size with the opening left in the black wood, in which it therefore fits, and forms the required pattern. In those ornaments which are shaded, the effect is given by dipping them in heated sand. The various parts being cut out, of the required tints, are now adjusted according to the design, and fixed on paper; they are afterwards applied, exactly as veneer, to the piece of furniture. Buhl, or Boule, inlay is conducted on the same principles as marquetry, only the various ornaments are cut out of sheets of metal, tortoiseshell, or ebony.

I have shown that it was the policy of the French government, and still is, to encourage and develope a knowledge of art among their manufacturing population. And I acknowledge that much has been done by our own, in the establishment of schools of design in various towns; but it is essential to bring before the eyes of art-workmen good examples; to form collections of the fine productions of former times; and thus not only to form schools of art for them alone, but to educate the popular taste, and thus create a demand for what is beautiful. With this feeling, I can scarcely believe that the Government have decided not to purchase the Soulages Collection.

Think of the Museums at the Hotel de Cluny and at the Louvre, at Paris, and compare them with our own! Compare also with our own the French exports of fancy goods, dependant upon taste —their furniture, their bronzes, their paper hangings, their printed muslins, their rich silks,—and then acknowledge, that as certainly as "*knowledge is power*," *taste is commerce*.

I will now hazard a few remarks upon the principles that should guide us in our designs for furniture. I will recite, if you will allow me, two sentences out of the report I was suddenly called upon to draw up on Furniture at our Exhibition of 1851.

"It is important, both for the strength and good effect of furniture, that the principles of sound construction be well carried out; that the construction be evident; and that, if carving or other ornament be introduced, it should be by decorating that construction itself, not by overloading it and disguising it. It is not necessary that an object be covered with ornament, or be extravagant in form, to obtain the element of beauty; articles of furniture are too often crowded with unnecessary embellishment, which, besides adding to their cost, interferes with their use, purpose, and convenience. The perfection of art manufacture consists in combining, with the greatest possible effect, the useful with the pleasing; and the execution of this can generally be most successfully carried out by adopting the simplest process."

Though these words are mine, the principles they enunciate are from a far higher source, and were published as early as 1841, by Augustus Welby Pugin—a man now, alas, lost to us—whose memory I revere, and whom I look up to as one of the greatest artists of his age—whose genius had scarcely begun to be known to the world, when he was struck down. He rarely mixed with society, and his high attainments and great powers of mind were therefore only fully known to the few who possessed his intimacy and his friendship. For some years previous to his death, I had the advantage of his advice and assistance in the Gothic furniture I made; and I have brought a few, out of the many of his designs I possess, to show to you.

I have lately heard it discussed whether Gothic furniture and decoration are suitable to a nobleman's house of the present day; and whether their forms and appliances are compatible with modern taste and comfort. In my opinion, there is no quality of lightness, elegance, richness or beauty, possessed by any other style, which cannot, with equal propriety, be maintained in Mediæval furnishing and decoration; and with this addition, that I know no style in which the principles of sound construction can be so well carried out.

Returning to the immediate subject of this paper, let us hope that the principles of true taste will guide us in improving our household furniture: it is as essential in the simple as in the more elaborate kinds. Let us avoid gross, exaggerated carvings, which, applied without meaning, only vulgarize everything they are intended to decorate. Neither let us imitate the French, in their exuberance of ornament. Let us feel that well-considered forms and proportions cost no more in their manufacture than distortions, and that utility and construction should be the element of design. To conclude, in the words of Pugin: "Let, then, the BEAUTIFUL and the TRUE be our watchword for future exertions."

The Chairman, T. L. Donaldson, H.S.F.C., after a few observations on the importance of furniture as an accessory to architecture, said, that whilst the Romans displayed considerable taste in some of their articles of furniture, it was remarkable that they had no carpets whatever, and that their mural decorations consisted of paintings; carpets and tapestry hangings were introduced from the eastern nations. The Greeks and Romans paved their floors with tesseræ in a great variety of patterns, amongst which the fret was the most frequent. Vitruvius mentioned an instance where the remains of a feast was represented by the tesseræ of the floor. Considerable magnificence was displayed in the furniture of Mediæval times, and as an interesting specimen, the Throne or Coronation Chair in Westminster Abbey might be referred to. This had been originally a magnificent piece of furniture, the wood being richly carved, and partially covered with a kind of stucco gilt. The other chair was a rude imitation of this in the very worst style. With regard to marquetry he considered it had originated in the art of inlaying in marble. This art, of which such remarkable examples were presented in the Cathedral of Florence and Giotto's Tower, appeared to have preceded that of inlaying in wood. Mr. Crace had ably illustrated the beauty of the marquetry of the age of Louis XIV; and, as he had observed, the furniture of the time of Louis XVI. became very much debased until, under Napoleon I., nothing could be more paltry than the taste displayed. The French, however, had resumed a better style of ornament, but it was to be feared that they were in the habit of carrying decoration to excess in furniture, as well as in architecture. The beautiful works of Fourdinois in the Exhibition of 1851, and the specimens of furniture exhibited in Paris in 1855, displayed very great merit. At the same time, as Mr. Digby Wyatt had shewn in his resumé of the last mentioned Exhibition, many in our own capital had produced works of considerable taste. To bring furniture to artistic perfection it was only necessary to uphold the cultivation of taste, and he could not but regret the miserable spirit of economy which stood in the way of the advancement of art, and was in fact a dishonour to the nation.

Mr. Scoles, Fellow, having observed that in the period of 1000 years, which Mr. Crace had passed over—from the Classical to the Mediæval times—the Byzantine period had intervened; and that this might have afforded some interesting illustrations; Mr. Crace said, that in alluding to the works of the tenth century, he had in his mind the Greek Manuscripts and other works of the Byzantine era, although he had not specially referred to them. He might remind the meeting that on a former occasion he had read a paper on Paper Hangings, in which he had given some history of Tapestry and other wall hangings, and he had therefore not thought it necessary to repeat his remarks on this occasion.

Mr. M. D. Wyatt, Hon. Sec., remarked that the ivory dyptichs presented an interesting series of examples of the seats of the Emperors of the East, from the time of Constantine, for two or three centuries. These seats, as well as the dresses of the Emperors were, in course of time, covered with jewels. The Great Seals of England and other countries also afforded illustrations of furniture, as the Sovereign was generally represented as sitting in state, and the cushions, with the arms and back of the throne were displayed. These seals were the work of the best artists of the time, and therefore illustrated the most advanced style of art in furniture.

Mr. Crace exhibited to the meeting specimens of marquetry which had been cut during the proceedings by one of Mr. Blake's workmen, and described the process and its results.

Mr. C. H. Smith, Hon. Mem., made a few remarks on the beauty of the mode of workmanship and the extreme accuracy with which the parts could be fitted together. He stated that supposing the work to consist of two alternate layers of brass and tortoiseshell, two patterns would be made, the one of brass inlaid in tortoiseshell, and the other *vice versâ*. If the pattern was carefully drawn, and the workman thoroughly skilled in his art, the result far surpassed anything that could be produced by other mechanical means.

Mr. M. D. **Wyatt** observed that in the establishment of M. Cremer, at Paris, the patterns for marquetry were printed in lithography, which had been found to do away with the errors incidental to the process of pouncing.

Mr. **Crace** agreed that this was a very ingenious and useful application of lithography. The paper however on which the designs were thus printed was liable to shrink unequally, whereas the greatest precision and accuracy was necessary in designs for marqueterie.

Mr. C. C. **Nelson**, Hon. Sec., drew attention to the subject of parquetry for floors. He had seen some parquetry employed by Herr Laves, the Court Architect at Hanover in 1836, at a very small expence; but he had been told that the parquetted floors of Buckingham Palace, executed under the directions of Mr. Nash, had cost something like £200. per square, including the rough main floor, one of wainscot, and the parquetry work upon it.

Mr. **Crace** said that instead of £2. per foot, the price of parquetry for floors was now more like £2. per square metre. In parquetry the ground formed an important feature. A very ingenious mode of forming this ground was by a series of cross bearers, one over another, leaving an open space between them, so that the shrinking one way should be counterbalanced by the shrinking the contrary way. The design itself was then cut out in far greater thicknesses than for marquetry, and, as a more perfect vertical position of the saw was required than could be obtained by any hand work, a machine or tool acting with a treadle was employed.

Mr. **Roberts**, Fellow, having alluded to Florentine Mosaic work as somewhat analogous to the subject under discussion, the **Chairman** observed that the specimens of Florentine Mosaic exhibited in 1855 did not sustain the reputation of that manufacture, whilst some of the Indian specimens were remarkable for the beauty of the inlay of hard marble.

Mr. M. D. **Wyatt** mentioned the inlaid table tops from Agra and Delhi exhibited in 1851. The jury on that occasion could not believe that not only the leaves and the petals of the flowers, but also the thin dark lines connecting them, were inlaid. It was thought that these lines were filled in with some sort of mastic, but it was found that in fact these lines were actually filled in with hard stone, worked on a lathe and cut with diamond dust or some other powerful abrasive powder. With regard to Florentine Mosaic, the materials employed were so valuable that it was impossible to execute them like marquetry. The separate pieces were each cut on the wheel, in the most careful way, polished like gems, and then fitted to the corresponding pieces.

Mr. **Baker**, Associate, inquired the kind of cement employed in marquetry, as it appeared a matter of importance, from the delicacy of the work, and the risk it might be exposed to from damp or heat.

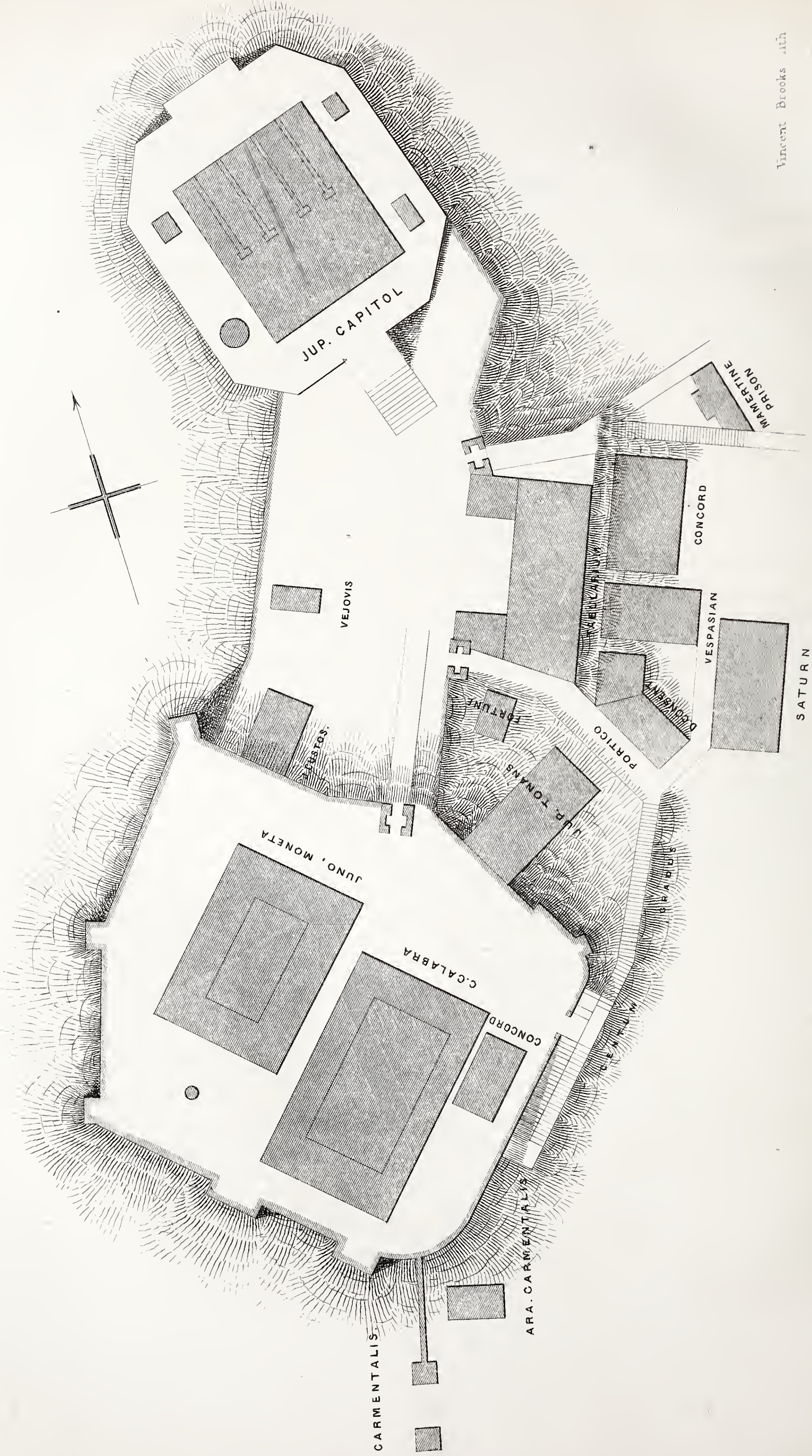
Mr. **Crace** said that ordinary glue was generally employed, and that gelatine was sometimes, but very rarely, used with satinwood and other light coloured woods, in order to prevent staining. He saw no reason however why marine glue should not be employed.

Mr. M. D. **Wyatt** suggested that Mr. Crace might explain the process used in the production of the coarse tables and mosaics, the pattern of which was produced by the repetition of certain geometric forms.

Mr. **Crace** said that the manufacture referred to was precisely similar to that which was carried on to a great extent at Tunbridge. The well-known "Tunbridge ware" was produced by layers of wood brought together longitudinally side by side, and cut into transverse sections. Although troublesome in the first instance this process was very economical, because, if the forms were well disposed, a slip of a couple of feet in length might be cut into an innumerable quantity of mosaic patterns.

Mr. M. D. WYATT suggested that this process might account for the facility with which the Queen of Spain's table (exhibited in 1851) was constructed. It was said that that table comprised something like 3,486,000 separate pieces of wood.

On the motion of the CHAIRMAN, thanks were voted to Mr. Crace, and the meeting adjourned.



Vincent Brooks lith

ON THE DIFFERENT THEORIES RESPECTING THE FORUM AT ROME, PARTICULARLY THOSE OF OUR LATE MEMBER THE COMMENDATORE CANINA.

By Arthur Ashpitel, Fellow, F.S.A.

Portion of the Continuation read at the Ordinary General Meeting of the Royal Institute of British Architects, April 20th, 1857.

Among the alterations immediately preceding the Imperial period, the first to be noticed took place in the Curia or Senate House, which, as has been related, was burnt at the funeral of Clodius. The mob infuriated at the loss of their leader, rushed to the Curia, tore up the benches and tables, seized the books and papers, and made a funeral pyre on which they burnt his body. The flames caught the Curia and destroyed it, together with the Basilica Porcia. This we learn from Dion Cassius and from the Commentary of Asconius on Cicero's famous speech in defence of Milo. The account of the former author is clear and circumstantial, and though it has been alluded to, strange to say, it never seems to have been accurately quoted. He states (lib. 40, page 144), that it was ordered that Faustus Sylla, the son of the Dictator, should rebuild the Curia; this he says was the Curia Hostilia, and that Faustus altered it somewhat during the building, and gave it his own name. If we turn to the 44th book, page 242, we find that in Cæsar's time, during the first triumvirate, Sylla's work was pulled down under the pretence of laying the foundation of a temple to Felicity, by Lepidus, when Master of the Horse; but, in reality, to get rid of the name of Sylla, and to build a new Curia to be called the Curia Julia. Turning to the 51st book (page 459), we find it stated of Augustus, "Then he performed these things, he dedicated the Αθηναιον (which may be translated Temple, Ædes or Atrium of Minerva), that which is called the Chalcidicum; and the Curia Julia which he had made in honour of his father." Again, under the works of Augustus, recorded in the Monumentum Ancyranum, it is stated that he built CURIAM ET EI CONTINENS CHALCIDICVM, a Curia, *and joining it* a Chalcidicum, or, as it is given by Gerhard, CURIAM CUM CHALCIDICO, a Curia *with* a Chalcidicum. There, our great authorities again differ, Becker is of opinion that the Curia Julia stood entirely on new ground. Canina's opinion is, that the new Curia stood on the site of the old (in this Mr. Dyer fully agrees with him); that it stood at the top of the Comitium, in which he is confirmed by Dion Cassius; that the Chalcidicum was a portico attached to this Curia, which seems to be clearly deducible from the Monumentum Ancyranum; and that a sort of Atrium, or entrance, attached to the Curia and within the Chalcidicum, was the Minervæum. In the absence of positive proof, the opinion of our late member really seems the most reasonable. Becker's idea that the new Curia could not have stood on the site of the old, has been shewn to be a misapprehension; and Bunsen's idea of a Minerva Chalcidica seems utterly groundless—as we read the inscriptions, a Curia Chalcidica might be tenable, because the names go together, but it seems quite begging the question, to suppose a Temple of Minerva Chalcidica, especially as such a building is not mentioned in any author or inscription, nor in any of the Regionaries.

It is strange to see the number of names that have been given to these three columns. For a long time they were called those of Jupiter Stator—but they cannot be, as that temple was close to, if not within the Palatine Gates. Poggio supposed them to be part of the Bridge of Caligula, though there is not the vestige of a bridge about them. Nardini considered them part of the Comitium, but that it has been shewn was an open space, and only covered occasionally. Nibby calls them part of the Grecostasis—Becker and Mr. Dyer, the Temple of Castor and Pollux. If Canina is right in his views as to the Comitium (and I think I have shown he is); if the Curia Hostilia stood at the end of the Comitium as the authorities prove; and if the new Curia was built on the site of the old, as seems clear from Dion Cassius, there can be no doubt that Canina is right, and that the three noble Corinthian columns which tower over the Forum are rightly designated by him as those of the Curia Julia.

The next alteration in the Forum was the erection of the Temple of Julius Cæsar. It is clear from a passage in Ovid, that this temple was at the eastern end of the Forum looking directly to the Capitol. Bunsen supposes it to have been on the Velia—but the Fasti Ameritini distinctly say, "Divo Julio ad Forum."

The next important change was the erection, or rather completion of the Basilica Julia, the position of which has been clearly defined by an inscription found there. Canina has placed it on the site of the old Comitium, and this position seems to be probable, for the change of times which had made the Comitia Curiata of less importance than the Comitia Tributa, had rendered both utterly useless compared with the voice of a Dictator. It appears that Augustus in order to do honor to all his relatives, wished this to be called the Basilica of Caius and Lucius, but it seems to have always retained the name of Julia. It must have been a gigantic building, 200 feet wide by 400 feet long, and according to the account of the younger Pliny, it was the Westminster Hall of Rome. He speaks of seeing 180 judices or jurymen there at once, and of his resorting there from time to time to hear the proceedings. The excavation of the remains has now completely put an end to conjecture as to whether the Forum extended lengthwise from north to south, or from west to east. This vast building standing quite across the way has settled the question, and in spite of some ludicrous attempts recorded in the Classical Journal, when the steps of the Basilica were first exposed, no one possessing the slightest classical acumen now maintains the old theory of Nibby.

We should now proceed to the curious and interesting investigation of the three temples under the Tabularium—but the facts and arguments relating to them, and the illustrations drawn from the celebrated passage in Statius, describing the Horse of Domitian, were so ably laid before you a few years back by our excellent Honorary Member, the Rev. Richard Burgess,* that I will not now dilate upon them. We now come to the consideration of the Capitol itself—a subject which has lately awakened unusual interest. In addition to what had already been written, a very able critique has just appeared in a late number of the Quarterly, upon Mr. Dyer's opinions on the subject of the Capitol, contained in his excellent article on Rome in Dr. Smith's Dictionary of Classic Geography. The writer takes the side of Messrs. Becker and Bunsen against Mr. Dyer, who adopts the views of Canina and Dr. Braun.

The nature of the Mount, a sort of saddle-back with an intermediate hollow, has been before described, and it seems clear from the account of Varro, that the entire hill was as much designated "Capitolinus," as the other hills "Palatinus" and "Aventinus." But from the circumstance of there being two summits, a sort of subdivision seems to have been adopted, and however terms may have been interchanged, one summit seems especially to have been called "the Arx," and the other "the Capitol," the hollow ground between being designated the Intermontium. The great question now is, which was "the Arx," and which "the Capitol." Mr. Dyer and Canina place the Capitol on the northern summit and the Arx on the southern—The reviewer, following Bunsen and Becker, reverses this order. Two things are agreed on by all, viz:—that the Temple of Jupiter Maximus stood on the

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* In his paper on the "Topography of the Roman Forum," read June 28, 1852.

Capitolium—and that of Juno Moneta, the Roman Mint, on the Arx, the spot where formerly was the house of Manlius. That the whole hill was called the Capitol, is clear from the fact, that it is always so named in the enumeration of the seven hills, just as the whole hill was formerly called the Tarpeian, and before that the Saturnian Mount. It took its name from the head of a man named Tolus (Caput Toli), being found fresh and bleeding under ground, while excavations were being made for the foundation (Jul. Obseq. 5). This event was considered such a prodigy as to justify the change of name. Now this was two centuries before the time of Romulus, and yet Livy (1. 10), describing his offering the Spolia Opima to Jupiter Feretrius, says, he ascended the Capitol, by which word, of course, the whole hill must be meant. When, however, classic authors speak of the hill alone without relation to the other hills, the Arx and the Capitol are mentioned separately; thus Livy describing the surprise of the place by Herdonius, of which we shall treat presently, says—"the news went to Tusculum that the Arx was taken and the Capitol seized upon;" in another place, "the Arx and the Capitol were in great danger;" in another, "the Arx and the Capitol, the dwelling-place of the Gods," and numerous similar examples might be quoted. But there is even something more, the whole hill was sometimes called the Arx. Thus, Servius in his Commentary on the Æneid, VIII, 652, says, "thus on the other part of the shield was modelled the Capitol because this is manifestly the Arx of the City." Mr. Dyer also cites a passage from Cicero (Ver: 2, 6), to the same effect.

Perhaps an example might be found among our own writers, when speaking of the Tower of London. It is often said such a one was sent to the Tower, tried and beheaded there, when in fact, the execution took place out of the Tower, upon the Tower Hill; and sometimes people are said to have been executed on Tower Hill, when in fact, they underwent their sentence on the rising ground called Tower Green, in front of the chapel and inside the tower walls. To doubt an English historian's accuracy because he might confound one spot with the other, would be too severe—and yet these are distinct spots, with a broad moat between them. Thus with respect to the Capitoline Mount, one summit should be called the Capitol, the other the Arx, the Intermontium between them: can we now define the right names for each division? Becker tries to settle the matter at once, by quoting from Livy, 35, 21, "A large stone, whether from the rains, or from a slight earthquake, having slipped, fell from the Capitol into the Vicus Jugarius and killed several people." Now we know this street began near the Temple of Ops, and passed close under the southern hill, but it has been shewn that the whole hill was called Capitolium, times without number, and therefore the passing expression proves nothing. He then quotes a passage from Suetonius, who, in relating the mad pranks of Caligula, says he built a bridge from the Palatine to the Capitol. If the Capitol had been on the northern summit, this bridge must have crossed the Forum at an angle, a thing highly improbable. But the fact is, we find on referring to the author, that the half-crazed, half-savage wretch, was seized with the desire of being adored by the people, and that he sometimes sat between the statues of Castor and Pollux in their temple inviting public worship, and at last pretended to receive frequent visits from Jupiter Capitolinus. "He then," says the author, "throwing across a bridge (ponte transmisso) over the Temple of Augustus, joined together the Palatine and the Capitol." There is not a word of the Arx, nor of *building* a Bridge. Not a word about the bridge in any other author, though such an erection a hundred feet high, and a quarter of a mile long must have been something to talk of. A bridge is said to be "transmissus," literally "sent across" not over an open space, but over the Temple of Augustus! Now, a little further, we read that another of his pranks was to scatter money from the roof of the Basilica Julia among the people; what then can be more easy and probable, than to suppose he had a light bridge, possibly moveable, thrown across from roof to roof of the temples, which would at last land him in the Tabularium, whence he could ascend to the Arx or to the Capitol as he pleased? I is evident he was in the habit of passing over the various roofs—and if so, what need had he of such a stupendous, such a gigantic bridge, of which no remains exist, and of which no author makes mention?

There is another story, of which Becker makes a great deal, and which requires a little more consideration. It is the account of the sudden surprise of the Capitol by Appius Herdonius, a Sabine by nation. The account is partly given by Livy, and at greater length by Dionysius of Halicarnassus (10—14), The facts occurred a little before the time of the famous story of Virginia. Herdonius seems to have been a sort of adventurer, who had

" Shark'd up a list of landless resolutes,
For food and diet, to some enterprise
That hath a stomach to it,"

in fact, he had collected as many exiles and slaves as made together a body of about 4000 persons. In justice to all parties let us take the account as given by Dionysius. He states, that Herdonius got his men together in some light boats, that "they crossed the Tiber at that part of Rome where the Capitol stands, which is scarcely a stadium (a little over 200 yards) from the river; then, it being the middle of the night, and all the city being deep in sleep, they went up at their will through the unlocked gates, for thus do the sacred gates of the Capitol remain through an oracle (they call them the Carmental gates); then, sending up their power, they seized the Φρουριον, or guard, then making an attack on the Arx (ακρας) they made themselves masters of it." Now, Becker reads the passage to mean that Herdonius came to the Carmental gates (not of the Capitol) but of the city itself; that he slipped through them, and then scaled the rock and entered the Arx, and thence the Capitol. But these difficulties directly suggest themselves; is it to be reasonably supposed a city would be carefully fortified with walls and gates, and yet the principal gate be always left open to the attack of an enemy? It can easily be understood why an inner gate should always be left open according to an oracle, especially when leading to a holy place like the Capitol; but an outer gate always open would be as useless as no gates or walls at all. But Dionysius does not say it was an outer gate; he says it was the gate of the Capitol, called the Carmental gate, and this it might well be. It was close to the Altar of Carmentis, and it has been shown that its name had varied; it was sometimes called the Saturnian gate, sometimes the Porta Pandana. In fact, there is a strong presumption that it never meant the Carmental gate of the city, and that is Herdonius brought his men by water. Now, if he passed the gate of the city by the river, landed his men within the city (which we can easily conceive), and then rushed upon the open gates of the Capitol, seized on the guard, and made himself master of the Arx and the Capitol, the whole affair is intelligible, and intelligible according to the notions of Canina. In fact, I must say these arguments of Becker's seem to me to prove nothing; and besides it is difficult to comprehend the account according to his views, and easy to understand it according to the ideas of Canina and Mr. Dyer.

But the great point made by the last writer on the subject, the Quarterly Reviewer, is based upon a well known passage of Tacitus, describing the attack on the Capitol by the soldiers of Vitellius. It was held by Sabinus, and the Vitellian soldiers seem to have attacked it in a hasty disorderly way, without any plan or leader. The passage in Tacitus may be thus translated:—"The furious solders approached with no general, every one his own leader; having gone round the Forum and the different temples, they attack the hill before them as far as the first gates of the Capitoline Arx. There were formerly porticos on the side of the clivus, on the right hand as you go up, from the roofs of which, going out, they overwhelmed the Vitellians with stones and tiles. These had no weapons except their swords, and it seemed too long to wait for the engines of war and missiles. They threw torches on the projections of the porticos, and followed the flames, and would have penetrated the burnt doors of the Capitol, had not Sabinus flung in their way, torn down from all quarters the statues, the glory of our ancestors, and blocked up the way as with a wall. Then they attack the different accesses to the Capitol that are near the grove of the Asylum, and where the Tarpeian Rock is approached by the hundred steps. The attack at both points was unexpected, but that at the Asylum was the closest and sharpest; they could not be checked, clambering over the closely built houses, which, in a long peace, had been suffered to come as high as the ground of the Capitol. Here there is some doubt, whether the besiegers threw fire on the roofs, or whether the besieged (for this is the more common report) did so to check the advance of the enemy. Be this as it may, the fire glided along the porticos attached to the temples. The rafters supporting the pediment, being of old and dry wood, caught and supported the fire; and thus the Capitol, though the doors were closed, though it was not defended, nor was it taken, yet was it burnt down."

Before we go into the question with the Quarterly Reviewer, let us enquire where the Tarpeian Rock was. Though it has been shown that the whole mount was formerly called Tarpeius, yet one portion of it, in latter times especially, bore that name. It was the place of execution, whence great criminals were hurled headlong down. We know from Livy (6. 20), as we shall see presently, that it was here the Gauls scaled the rock, and hence Manlius was afterwards cast down, so that, as he observes, "the same place, the Tarpeian Rock, was a monument of his glory and of his last punishment." We also know from Livy (5. 47) this was close to the Altar of Carmentis. Becker, with his usual heat, and somewhat unhappily, supposes this spot to have been on the other side of the hill, overlooking the present city, close to the Tor degli Specchj; but he disregards the fact that this is not near the Altar of Carmentis; and still worse, that Dionysius of Halicarnassus, speaking of the execution of Spurius Cassius, expressly says it was "from the rock overhanging the Forum," (8. 75,) and he makes use of the same expression in the history of Caius Marcius (7. 35). The exact spot, is probably the cliff in the Gardens of the Società Archeologica, which is at present at least 70 feet in sheer perpendicular height. Now this, as has been seen from Tacitus, was approached by the hundred steps: among the Capitoline stones is one showing a long flight of steps leading to some very great height, with a temple near it. This Canina thinks to be the plan of the "Centum gradus," and it seems certain he is right, for a similar flight could not have formed the ascent to any other hill. The principal points relative to the Tarpeian Rock may thus, I think, be considered as settled.

Reverting, now, to the observation of the Quarterly Reviewer, we are startled at the outset by the statement, "The only access to the Capitol or the Arx was by the Clivus Capitolinus." Why, the very words of the author are, "Then they attack the different accesses, 'diversos accessos,' where the hundred steps are, and close by the grove of the Asylum." There must, therefore, have been at least three entrances, one from which they had been driven by Sabinus; that of the hundred steps; and another by the grove, and this probably was the one by the Gemonian Stairs, at the other end of the Tabularium; in fact, where the present access is. Then the Reviewer says, "they mounted to the first doors of the Capitoline Temple." Why, the very words of the author are, "the Capitoline Arx." He then goes on to say, "the Capitol would, of course, abound with statues, but we should not expect this of a bare fortification like the Arx." Now Tacitus is clearly speaking of nothing of the sort, he says there were porticos on the Clivus, and the defenders were on the roofs, and that the Vitellians, so far from being overwhelmed either from the Capitol or Arx, actually never even reached the first doors. Who can doubt that these were the gates of the Porta Pandana or Saturnia, or, as Dionysius would call them, the Porta Carmentalis? Then, says the

Quarterly Reviewer, they diverged into the Intermontium, and attacked it on that side. There is no proof they ever entered into the Intermontium at all. But perhaps the most extraordinary part is, that he next enlarges on the defensibility of temples in general, when Tacitus expressly tells us, "the Temple was neither defended nor taken, but was burnt more by accident than design." In fact, the idea of Canina is far more clear and consistent. He supposes the second attack to have been made on the other side of the Tabularium. There are now houses near this height, lofty enough from which to throw torches on to the Church of the Ara Celi, where Canina supposes the Temple to have stood, the mount at this point not being so steep as at the other summit, which is actually precipitous. It is stated that it was a sudden rush, and the defenders had not time to meet it, and perhaps did not perceive it till the fire warned them of the fate of the sacred building.

Having examined one side of the question, let us see what is to be said on the other; and first of the Temple of Jupiter Capitolinus. We have a careful account of it by that excellent historian, Dionysius of Halicarnassus. It was begun, he says (3. 69 and 4. 61), by Tarquinius Priscus, in consequence of a vow. It was about 200 feet square, the length exceeded the breadth only by 15 feet. The king commenced by levelling the ground, which was very irregular, and he also built huge αναλημμàτα, or retaining walls, filling in with earth behind them. Now, it has been urged that, however unnecessary this might be on the smaller summit (where, by the way, parts of such retaining walls remain to the present day) it would not be so on the other summit, which contains about three times the area. The work was continued by Servius Tullius, and finished, but not dedicated, by Tarquinius Superbus. Dionysius tells us, the Temple had three cells under one roof, dedicated respectively to Jupiter, Juno, and Minerva; it had three rows of columns in front, and two on the sides; but as he says nothing of the back, we may suppose that it was plain: here, again, is a strong argument that the Temple stood on the northern height. They would hardly place a handsome front where it could not be seen, and expose a plain back to the city, as well as to the rest of the Capitoline Hill, as must have been the case were the positions reversed. Besides, the triumphal processions must have approached the back of the Temple instead of the proper front, which we know faced the south. If the Temple stood on the southern hill facing the river, the only way of approaching the front must have been by the hundred steps, or by some circuitous route. Another argument equally conclusive, is, if the Quarterly Reviewer's argument is correct, and the Vitellians made their successful attack from the Lucus Asyli, they must have set fire to the back of the Temple, and not to the front, the fastigium, as Tacitus expressly tells us they did. Another strong presumption is taken from a passage in Pompeius Festus (voce Saxum); this, though somewhat mutilated, shews clearly enough, that the part especially called the Tarpeian Rock was separated from the part especially called Capitolium, because, he says, "they were unwilling that that unhallowed place (funestum locum) should be joined to the other." Whether by "unhallowed," he means on account of the death of Tarpeia, or, as is more probable, because it was the place of execution, does not appear. Still, on the latter ground alone, it seems inconceivable that the Tarpeian Rock, the Tyburn of Rome, should be on the sacred precinct of the Capitol. As well might we conceive the drop now at Newgate to be placed in front of St. Paul's. But we have shewn clearly where the Tarpeian Rock must have been; is it at all likely, then, that the holiest place in Rome, the dwelling of the Gods, the palladium of the city, should be in the closest proximity of the scene of the butchery of the executioner? It seems impossible.

We now have to examine the story of the attempt of the Gauls to surprise the hill by night, and its defence by Manlius, as given by Livy in his Fifth Book, and by Plutarch in the Life of Camillus. It will be remembered, that that General wished to communicate with the besieged, and a young man, named Pontius Cominius, undertook the dangerous task. Making a sort of raft with the bark of trees, he swam silently across the river and scaled the rock, fortunately we are informed of the exact spot, close to the Altar of Carmentis; having delivered his message, and obtained his answer, he descended by the way he came, and returned to Veii. Shortly after, some of the Gauls wandering about, found traces where the rock had been ascended, and immediately determined to do the same in the dead of the night, and to surprise the garrison. "It was a dusky night," says Livy, "they sent before them one without arms to try the way, then some thrusting and some pulling each other up, as the nature of the ground required, they got to the top in such profound silence, that they not only deceived the sentinels, but the very watch dogs. But the geese were not deceived, which being sacred to Juno, had not been eaten, although there was the greatest want of provisions. This saved matters, for Marcus Manlius, who had been Consul three years before, being waked by their noise and the flapping of their wings, seizing his arms, and shouting to the others, rushed upon the Gaul who also had just stood on the summit, and thrust him down with a blow from the boss of his shield. His fall knocked down those behind, and the Romans, with their darts, and with large stones, soon routed the rest." The exact spot we know; now the question is, did all this take place in the Arx, or in the Capitol. It will be seen, it was all the work of a moment; and there are several strong presumptions that it was in the Arx. The first is, that Manlius lived there, he was a man of Consular dignity, it was not his watch, and there is every probability that he was sleeping in his own house, near which (in the area of it, as Livy tells us) the Temple of Juno Moneta was afterwards built, according to the vow of Camillus. Here also must have been the shrine, or some place dedicated to Juno, where the geese were kept. From the first alarm to the arrival of Manlius, a few Gauls only had time to get on the summit; so it is clear Manlius could not have ran from the other height, descended fifty feet into the Intermontium, and mounted up thirty feet again, traversing a quarter of a mile of ground. But, say the opponents, it does not follow that Manlius must have slept in his own house. The probability surely is that he, a man of consular dignity, the highest officer in the state, did so; but at any rate, if the northern summit was the Arx, that was the spot sacred to Juno, and where the geese must have been kept. Is it likely that they would hear at a quarter of a mile off what the men and dogs, who were close by, could not? And is it likely, if they gave the alarm there, that the Romans should not have ran to where they heard a noise, rather than have turned round in the very opposite direction? But, says Becker, you all admit that the Juno Moneta was built on the site of the house of Manlius, and that was in the Arx. We do; all the authorities agree on it, and as lawyers would say, that is part of our case. He then refers us to some very obscure lines from the First Book of Ovid's Fasti, 637, which literally translated, run thus: "Oh! white Concord, the next day places you in your snowy temple, from where high Moneta bears her lofty steps, and now you well behold the Latian crowd." And he says, there must have been steps from the Temple of Concord to the Northern height, where he asserts the Temple stood; but this is begging the question on the one hand; and on the other, the lofty steps were probably the hundred steps which we see from the Capitoline plan ascended the other hill. As the Temple of Vespasian was not built till long after, that of Concord would literally be at the foot of these hundred steps. It may mean, that a Temple of Concord stood on the hill near the Moneta, which latter was ascended by lofty steps. Now what has Becker to reply? he shifts his ground, and takes another, and what appears at first sight, a stronger stand. He shews that large meetings of the people used frequently to assemble in the Area Capitolina, and he contends, that the Temple must have filled up so much of the northern summit, that there was no room left for such assemblages, while on the southern hill there would be plenty of space. But this again is begging the question. There is no proof—in fact, it is very unlikely that the atrium, or τεμενος of the Temple, was ever intended for such meetings, or called the area. Let us turn to the account of the death of Tiberius

Gracchus, given by Plutarch in his Life, and by Velleius Paterculus in his Second Book. It happened there was a large meeting of the senators, optimates, and knights, and Gracchus came up with a mob (caterva) of plebeians, armed with clubs, and their togas gathered up all ready for a fight. The principal man of the opposite party was P. Cornelius Scipio Nasica. He went to the Capitol, Plutarch says (Paterculus tells us, standing on the top of the steps of the loftier part of the Capitol) and covering his head with his gown, in the same manner as the Pontifex Maximus was accustomed to do in the most solemn rites, he called on all those who wished to save the country to follow him. The patricians were unarmed, but they tore up the benches, and seized the legs and broken pieces, and charged the mob who were standing in the area; Gracchus fled, and as he was running down the clivus, a broken footstool was hurled at him, which struck him on the head and killed him. Now, it is clear from this, that the mob must have been in the Intermontium (which is here called area), for they were on the Capitoline Hill, not down in the Forum, but in a part below the steps. The presumption is from Scipio's performing the sacred rite, that he stood on the steps at the front of the Temple, and which, as has been shewn, faced the south; so that the whole argument appears to recoil against Becker, and another probability is added to the views of Canina.

I have now brought the second branch of the subject of the Roman Forum to a close. The next portion of the subject will be the Fora of the Emperors; and should my audience not be wearied with a mass of classic matter, which necessarily requires the closest attention, I propose at some future time, to enter into a short resumé of all the authorities on the subject, taking each object which now is, or which must have existed on the sites in succession; shortly pointing out what Livy, or Pliny, or Dionysius, or any other author may have said on it: and then shewing, whether from existing remains, ancient medals, or bas-reliefs, the probable restoration of each, so that we may have before us, in the most convenient form, all the materials for the satisfactory investigation and discussion of this most interesting and most important subject.

After the reading of the paper, Mr. Donaldson, H.S.F.C., proceeded to develop at some length his ideas respecting the buildings on the Capitol; the line of the Via Sacra; the position of the Roman Forum; the direction of its longer axis, &c., matters on which he differed very materially in many points from the opinions of the authorities mentioned in Mr. Ashpitel's paper. Mr. Ashpitel vindicated his positions; but, being prevented by the lateness of the hour from entering further into a discussion, expressed his willingness to bring the subject again forward for debate.

The thanks of the meeting were cordially awarded to him, and the members and visitors adjourned.

AN ADDRESS ON THE SACRED GROTTO OF ST. BENEDICT AT SUBIACO, AND ITS MONASTIC INSTITUTIONS,

DELIVERED

At the Ordinary General Meeting of the Royal Institute of British Architects, May 18th, 1857,

By M. Digby Wyatt, Honorary Secretary.

After the presentation of the Royal and other medals, Mr. M. Digby Wyatt, Honorary Secretary, proceeded to offer some observations on the above subject, regretting that the late hour of the evening obliged him to compress them into so narrow a compass that he was fearful it would be impossible to obtain for his subject that attention which, properly enlarged upon, he did not doubt its architectural importance and historical interest could not fail to ensure for it.

He commenced by reminding his hearers that St. Benedict was as completely the patriarch of the Western Monks, and the founder of all the properly organized monastic systems of Europe, as St. Paul, the proto-hermit, St. Anthony, St. Basil, and St. Jerome had been the precursors of those of Africa and Asia previous to his advent. During the first three centuries of the Christian era numbers of the persecuted occupants of the Catacombs fled to the rocky fastnesses skirting the Campagna of Rome, and there led lives of seclusion analogous to those of the Fathers of the Desert, and many such still dwelt in similar shelter, and in more or less complete isolation, in the days of St. Benedict, nearly two hundred years after the adoption of Christianity by Constantine. It remained, however, for that worthy Saint and unquestionably excellent man to introduce the bond of union and of common charity among such recluses; thereby instituting the system of mutual protection and good offices which lent that power to the regular clergy which enabled them to make head against the turbulence of a wild and rude age, and ultimately to attain an unprecedented influence over men and manners, history, literature, and faith, throughout the whole of the Middle Ages.

The monasteries of Subiaco, Monte Cassino, San Calisto at Rome, and numerous others in Italy and other countries of Western Europe attest, at the present day, the extensive influence exercised by the Benedictine Order, the proverbial protectors of such learning and science as were compatible with the rude energies of Mediæval life. From the great fountain head numerous branches germinated in later times. Saint Bruno (1030-1101) became the founder of the Carthusians, and Saint Bernard (born 1091) of the Cistercians—which latter body possessed Fountains Abbey (so worthily preserved through the zeal of the noble President of this Institute) and many of the fairest domains in this our native country.

The Grandmontines, Clugniacs, and Premonstratensians lived also under the rule of St. Benedict, though under a somewhat different discipline. In this country the possessions of the Benedictines were immense. With the exception of Carlisle they owned all the cathedral priories and most of the richest abbacies. Even at the period of the dissolution of monasteries, Bishop Tanner, in his "notitiæ," enumerates no less than 186 important religious establishments still in their hands, despite the active competition which existed between them and the Dominican and Franciscan Orders. Until the end of the twelfth and the beginning of the thirteenth centuries, when the founders of these two last named orders flourished, the Benedictines were the presiding rulers over architectural and all other art, and it can surely, therefore, be no uninteresting duty for us to trace out the vestiges they have left of their skill and taste profusely scattered around the spot hallowed beyond measure in their hearts by the unquestionable presence and love of their admirable founder.

With the age of St. Francis, great changes of every kind in faith, manners, and art were introduced, and one of the most interesting studies of the comparative anatomy of architecture which can be made is between the great monastic establishments founded by him at Assisi, and that established at Subiaco by St. Benedict. St. Francis was born in 1182, at the former place, and in its Church Giotto has represented the most remarkable events in his life in a well known series of fresco paintings. An analogous series of frescoes, representing the leading incidents of St. Benedict's life, and to which we shall hereafter refer, is to be met with at Subiaco.

This romantic spot, venerated by the Catholic as a shrine, and by the artist as one of the loveliest spots upon the face of the earth, is grandly situated in a gorge of the mountains about forty miles eastward of Rome. Its name is a corruption of Sublacum, derived from its position below the artificial lakes formed by Nero in the grounds attached to his villa, by damming up the course of the Anio, a stream which ultimately falls into the Tiber above Rome. It was in this splendid villa that the scene so tersely and yet vividly depicted by Tacitus took place, when the lightning from Heaven dashed the golden cup from the tyrant's hand as he was carousing, and yet spared his execrable life. These artificial lakes existed for centuries, till on the 20th of February, in the year 1305, a sudden flood burst the barriers—the traces of which catastrophe may still be seen on the sides of the mountain gorge. Fragments of the remains from the Emperor's villa may be detected appropriated to strange and modern uses in the adjoining conventual and secular buildings.

The whole of the scenery about Subiaco is most wild and picturesque. The road to it from Tivoli, after following awhile the ancient Via Valeria, is carried along the very verge of the gorge,—the town perched on a height,—the monastery embowered in foliage,—and the magnificent ravine, by following the windings of which, on a strangely artificial path, it can alone be reached from the town, are subjects familiar to, and endeared to the memories of most tourists and artists. At the distance of about two miles from the town of Subiaco the gorge contracts, and the mountains on either side rise almost vertically to a height of little less than two thousand feet from the valley, along which the rushing Anio cleaves its noisy way. On the left hand side, at about one thousand feet from the stream, there are several small caves and a little table of land dark with Ilexes of immemorial growth, accessible only, before the formation of an artificial footway, at imminent danger to life. Far above these grottoes the cliff rises precipitously to another table of land at its summit. It was to one of these caves that St. Benedict fled, at the early age of fourteen or fifteen years, from the world and such allurements as the semi-barbaric age in which he lived could offer.

Born of noble parents, respectively of the Anician and Claudian families, at Norcia, in the Dukedom of Spoleto in Italy, A.D. 480, he was taken to Rome for education, where he became disgusted at the vicious courses of the inhabitants, in whom the graces of Christianity had at that period but imperfectly expelled the sensual traditions of Paganism, and fled, first with his nurse, and ultimately alone, to the deserted spot above described. Here it was that he was supplied with food by the generosity of Romanus, a monk of a neighbouring monastery, whose only communication with the youthful recluse was effected by letting down a string along the face of the cliff from the upper table land to the grotto in which he had taken up his abode. The life of St. Benedict, by Pope Gregory the Great, the especial patron of the Order, who was removed from its founder by but one generation, does not fail to depict the temptations which the Saint encountered from the evil one in various shapes in this retreat, and the manful way in which they were overcome. Subsequently he was induced to become the Abbot of the curious rock-cut monastery of St. Cosimato in the vicinity; but the strictness of his rule occasioned so many plots against his life that he returned to his former solitude.

His fame having now extended far and wide, numbers flocked to him, and through the liberality of the faithful, he was enabled to erect twelve monasteries on the rocks surrounding his retreat. Having, with the assistance of his affectionate disciples, St. Maur and St. Placid, established and confirmed, in regular order, these religious establishments, the Saint went on to Monte Cassino. There he met with a set of inhabitants still profoundly embued with Paganism, and worshipping Apollo in a sacred grove. These misguided people he converted, and having induced them to cut down their sacred grove and to desecrate their temple, in the year 529 he laid the foundations of that monastery which, vastly increased in after ages, grew to be the great head quarters of the Order, and became for many centuries the depository of all that was most advanced in the art and learning of the Dark and Middle Ages. Here it was that the Saint expired in the sixty-third year of his age.

Of all the twelve monasteries established by St. Benedict at Subiaco little trace is to be met with in the present day. Lombards, Saracens, turbulent feudal chieftains, and dishonest administrators gradually swept away almost all that there was of the primitive institution, and scarcely anything but a few fragments in the neighbourhood, and the foundations of portions of the monastery of St. Scholastica attest the importance of the original institutions.

This last mentioned noble structure consists of an entrance courtyard, surrounded on three sides by a wall, and on the fourth by buildings; to which succeeds a cloister of modern date, arcaded on two sides. Beyond stands the oldest portion of the monastery ascribed to the year 1052, irregularly disposed to suit the site and formation of the ground, and much modified by insertions of later date, among the most important of which is a striking arch of "flamboyant" character. The refectory is situated between this cloister and one built by Abbot Lando in the year 1235. The ambulatory of this last is formed by bays of stilted semi-circular arches supported on slender marble shafts, with capitals and bases, in the Byzantine style, the whole bearing a strong resemblance to those to be seen in the cloisters of S. Saba and of Sta. Sabina at Rome. Large pointed arches of construction are seen in the refectory and in the church. The latter was built by Benedict VII. in 981, with a campanile of the usual early Christian character, but covered with a low pyramidal roof. At a much later period, in 1769, a new interior, in modern Italian taste, with a waggon-headed ceiling, was built within the outer walls, they being left almost undisturbed, so that the whole of the interior now visible is modern, with the exception of the apsidal choir end, which was not much altered. The exterior has been recently decorated in doubtful taste. The finely painted chapel of St. Michael and All Angels in the crypt is said to contain the body of St. Bede, but Bishop Ullathorne (R. C.) has recently proved, at once eloquently and learnedly, that this is not the Venerable Bede, our countryman, originally interred at Jarrow and stolen from thence to enrich the sanctuary of St. Cuthbert at Durham, but another personage—St. Bede the younger, a Saint of Italian origin and rather later date.

The mosaic work in the arcade of Bishop Lando's Cloister is attributed to the Cosmati family, who were much employed as architects, sculptors, and mosaicists at Rome, Orvieto, and elsewhere in the Roman territory. Seroux d'Agincourt, who gives careful plates of this cloister, and of the other buildings at Subiaco ("Architettura" tavole xxix and xxxv.) supplies a copy of the original inscription testifying to the above fact in the following words (the abbreviations being supplied):—"Cosmas et filii Lucas Jacobus alti Romani cives in marmoris arte periti hoc opus expleverunt Abbatis tempore Landi." [The architectural and round arch peculiarities of this cloister, which are of remarkable interest as compared with later works of the Cosmati in the pointed style at Rome and elsewhere, were very fully illustrated by Mr. Wyatt's drawings.] Santa Scholastica, whose name is attached to this monastery, was the beloved sister of St. Benedict, and a virgin dedicated to a holy life. She was the foundress of the important order of Benedictine Nuns, the annual revenues from whose temporalities in this country at the date of the dissolution of Convents, &c. amounted to very nearly £8000., a great sum at that period.

The Mediæval history of the Monastery of Santa Scholastica affords a striking illustration of the turbulent spirit which prevailed among the Barons of those days, and of the manner in which the Papal anathema, blended with apostolic admonition, was necessarily called into action to maintain at once the influence and the possessions of the Church. Here almost within sight of Rome, the Pope's authority was boldly set at defiance by the Barons, and it was only through the great Hildebrand's placing a man of known nerve and determination, Abbot John, at the head of the establishment, after deposing his weak predecessor, Abbot Humbert, in the year 1062, that right and order could be established, and the monastery secured in the full enjoyment of its patrimony. Not only did this same Abbot John carry on many of the works which had been begun by his predecessors at Santa Scholastica, but he also made a wonderfully costly road to the Holy Grottoes, and completed the various noble chapels surrounding and protecting them which had, so far as the lower chapels are concerned, been begun by Abbot Humbert.

About a mile and a quarter distant from Sta. Scholastica, by a lovely path winding along the precipice, and supported for the most part on buttresses clinging to its face, are the monastic buildings connected with the "Sagro Speco," the cavern in which St. Benedict is stated to have taken refuge, and the picturesque situation of which has been already fully described. The approach to them from the entrance gate is under a grove of Ilex trees, the impenetrable shade of which upon a sultry day never fails to be most refreshing to the pilgrim after his toilsome walk along the somewhat rugged mountain path. The peculiar nature and position of the caverns have given rise to the form and arrangement of the monastic buildings and chapels grouped about them. A huge portion of the rock, that over which St. Romanus is related to have lowered the cord with food for St. Benedict, overhangs the monastery in a manner so obviously and imminently dangerous as to afford occasion to the monks to adduce its position as a proof of direct divine interposition in their favour. The scene on entering the Upper Church is most striking. The rays of light from its single west window fall everywhere upon surfaces glowing with colour. With the exception of the time-stained marble pulpit and its curious coffered ornaments, evidently imitated from the fragments of the lacunariæ of the Villa of Nero, all is fretted with an endless variety of hues. Even the fine old pavement of Opus Alexandrinum ministers to the brilliancy of the general effect. The largeness and simplicity of the early pointed forms, the size and severity of the painted figures and groups, and the grand unity of aspect in shade produced by the admission of a flood of light at one point only, effectually prevent the slightest approximation to frittered or meretricious grace. Behind the high altar of the Upper Church, a descent of a few steps, on either side, leads to the Chapel of Sta. Scholastica, from which a long descent of steps passing under the high altar of the Upper Church communicates with the Lower Church or crypt. On the lowest level of this church, and between the side work and the living rock, is the grotto of St. Benedict. Following the sinuosities of the precipice outwards, steps still descending lead to the Chapel of St. Lawrence, and over it is the Chapel of St. Gregory, to which access is given from the lower Church by a species of mezzanine gallery. At the lowest level of all is the so-called Rose Garden (once filled with briars till the advent of St. Francis), with various other grottoes cut in the rock.

The Gothic of the churches in the Sagro Speco may be described as good Italian Gothic—decidedly distinct from our Western styles—and more similar to that found in Sicilian buildings of like date, than to any other examples of early pointed work to be found in the North of Italy. It is however to the vast amount of coloured decoration on the walls, especially of the upper church, that the peculiar interest and charm attached to the building is to be ascribed. [Mr. Digby Wyatt had seen before he left England the effect which a partial use of colour would produce, in the church which the late Welby Pugin had constructed at Nottingham in this kingdom, and in other buildings by that accomplished architect, executed prior to the year 1846; but it was not till he visited Subiaco, that he realized the satisfactory result of an ecclesiastical interior entirely covered with coloured fresco paintings and ornamentation. It was more especially on this account that he was induced to make elaborate studies of the interior in most of its parts—accurate representations of which, done upon the spot, he exhibited to the meeting. Carefully, however, as they had been made, Mr. Wyatt regretted the impossibility of doing justice to the singularly picturesque aspect of these beautiful chapels]. With their richness of tint, strange diversity of plane and level, singular contrasts of brilliancy and sobriety of lighting, every step produced some new picture—some fresh and happy combination; and he felt that there was in them sufficient work for months of an artist's time, rather than for the happy week or ten days only he had been enabled to devote to them.

The Chapel of St. Gregory contains a fresco portrait of St. Francis, dated 1223, the time apparently of his visit to the convent—which from its representing him with the cowl of his order, instead of the nimbus of canonization, might be assumed to be a faithful representation done from the living man.* In the lower chapel, the establishment of the community of the Sagro Speco, by Pope Innocent III., and the donation of the Bull to the first Prior John Tagliacozzo in 1213, are represented in large frescoes, in which the probability of portraiture is again apparent. Such a faithful mode of handing down historical events pictorially to posterity might, Mr. Wyatt observed, be worthy of attention in the present day, as decidedly more instructive and rational than portraying imaginary Cœur de Lions and Joans of Arc in our houses of Legislature. Another fresco of great beauty and a later date (1489) in the Chapel of the Beato Lorenzo Loricato, signed by Stamatico, is a highly interesting example of the state of the art of that time.

The fresco decorations of Subiaco possess much greater interest in the history of painting than has been generally ascribed to them. They are unquestionably of at least four distinct and highly characteristic periods.

The first or earliest specimen in the rude manner of the artists of the catacombs, which is roughly painted against the side of the lower grotto, less difficult of access than the upper one, and in which it is said St. Benedict first received those who came to receive his admonitions and attend his ministrations, may very possibly date from the age of that saint, *i. e.* from the commencement of the sixth century.

The second set of examples is in the stiff and severe Greek style which preceded the manner of the great Florentine innovator, Cimabue. To this belong many of the paintings in the lower chapel, first built to protect the Sacred Grotto; and among them may be noticed especially the Representations of the Establishments of the Community, by Pope Innocent III. (1198-1216), the Consecration of the Church by Pope Gregory IX, and the Virgin and Child supported by Angels. This last is to be especially noted as to be identified by the inscription "Magister Conxolus pinxit hoc opus." This Magister Conxolus was a Greek, and authorities (Lanzi and Bishop Ullathorne) are agreed in considering that he worked at Subiaco as early as the year 1209, thirty-one years before the birth even of Cimabue. It may not be unimportant, in connexion with this date, to observe, that many Greek monks, who had been driven away from their monastery at Grotta Ferrata in 1165, by the wars which at that time took place between the Albanians and Tusculans, were residing at the Sagro Speco, to which they had fled for refuge. Through them it was that the establishment at Subiaco became possessed of that most interesting relic, evidently of great antiquity, the black camel's hair cowl, said to have been the capouche or hood of St. Basil, and to have been brought to Italy by his friend St.

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* An engraving from a careful tracing of the head of the saint will be found in D'Agincourt's great work (Pittura, tav. c.)

Gregory Nazianzen, by whom it was presented in the year 378, to the then Abbot of that very Monastery of Grotta Ferrata. Under the auspices of such a body as these Greek monks, it seems anything but unreasonable to suppose that the skill of Conxolus must have been fully developed. In 1066, we know from Leo Ostiensis, that Desiderius, Abbot of Monte Cassino, desiring to rear a noble church in honour of St. Benedict, had sent to Greece for skilful workmen in mosaic; and their works mainly contributed to give that great stimulus to pictorial art which led to the ultimate formation of the South Italian School.

The third set of paintings, those for the most part in the upper and middle chapel, giving touching and spiritual representations of sacred subjects and legends from the lives of St. Benedict and his sister Scholastica, have evidently been wrought by one carefully tutored in all those changes in religious art which were introduced under the auspices of the Franciscan and Dominican Monks. They apparently date from about the year 1400, and as we know that Subiaco had an artist about that period, who wrote the following inscription (copied by Dr. Ullathorne) on a picture still preserved in the old Church of St. Eustace, not many miles distant: "M. Bartholomew, of Subiaco, painted this work with good faith in 1424. oh Lady help me, I ask no reward but this," we may be not very far wrong in supposing that some of these works may have been from his hand.

The last set are those in the exquisite little Chapel of St. Lorenzo Loricato, in which a considerable degree of beauty, both of form and tender colour, are blended with a singularly archaic treatment of form, shown more particularly in the draperies, This severity of treatment is extremely unusual at so late a period as the latter half of the fifteenth century, when Naturalism had already acquired a great ascendency over the artist mind; and if the painter of the principal subject over the high altar—the Virgin and Child surrounded by Saints--was not attested by his nearly adjoining signature of "Stamatico Greco pictor perfecit, A.D. 1489," one would naturally antedate the picture by nearly one hundred years. As it stands, this series of frescoes curiously illustrates the clinging of the Greek artists at even so late a date, and despite great improvements in feeling, form, and composition, to their old rigidity of action and arrangement.

[Mr. Wyatt, after expressing his obligation to Bishop Ullathorne's graceful and learned account of his visit to the monastery for much of the historical information he had been able to bring forward, concluded by expressing his regret that the hour was too far advanced for him to tresspass further on the attention of his auditors, although he felt most strongly that his subject was one replete with the highest interest to all students of art and archæology, and by no means devoid of importance to the practical designer and architect.

The thanks of the Meeting having been most cordially voted to Mr. Wyatt, the Members adjourned].

SOME REMARKS ON DOMES,

Read at the Ordinary General Meeting of the Royal Institute of British Architects, June 1, 1857,

By T. H. Lewis, Fellow.

Of all the forms created by the architect, the dome is perhaps the noblest. There are few of us who have not seen with admiration the immense domes of Rome and of Florence towering high above all around; and here at home, the dome of our cathedral, bursting through the smoky cloud sent forth from the myriad of houses, majestically rears its golden cross, and constitutes the well-known crowning feature of our city. In the following general sketch of the origin and the progressive development of outline of Domes, I propose to enter but very slightly into the question of construction, though I think that this part of the subject has not yet been treated as it should be, and that a monograph of it, working out the theory from actual examples, is still wanted.

Late discoveries in Egypt and Assyria have laid open many a work of ancient art before unknown; but we must still seek in Greece for the earliest examples of our subject, viz., at Mycenæ and Orchomenos; to which two instances we seem limited in that country. The Abbé Winckelman indeed, no mean authority, maintains that the Greeks through all ages used this form of covering; but I have carefully searched the passages to which he refers, and find that his only grounds of belief are the use of the word θολος by Pausanias in his description of several buildings, and some exceedingly doubtful passages in other authors. Pausanias makes no mention whatever of any peculiar form of covering, and I believe the meaning of the word θολος as applied to a dome is a later reading. One instance, however, of a bas-relief in the Clementine Museum, to which the Abbé alludes, gives at first sight some colour to his theory. I find, however, that it represents a tower, apparently of wood, on the prow of a ship, and that the date of the bas-relief and of the invention of the towers themselves is uncertain. It seems to me that the most inveterate essayist could scarcely found a theory upon this. I have also been reminded of a doubtful passage of Cratinus referring to the Odeum of Pericles; but Vitruvius, who gives a long description of that building, makes no mention of a dome. In Sardinia we have those curious buildings described by M. Petit Radel. In Etruria we have some few instances such as I have given from Riello; and in the Crimea, the tomb of Mithridates at Kertch: but the dates and the builders are doubtful, and we must return to Greece before we are on sure ground.

At Mycenæ we see the form, if not the construction of the dome, worked out by a master hand with no little skill; and most singular is it that for nearly 1000 years (so long is it to the next example) that form remained, so far as our knowledge goes, uncopied, though in the heart of the country. For it is not a ruin whose form can be developed only by the patient labor of the antiquary. The hand of time, which has weighed heavily on works of a later date, has passed gently over this, and whilst it has only spared a few columns at Corinth and at Thebes, and little at Argos and Epidaurus but the rock cut steps of their theatres, it has left this earlier work almost unscathed, as though to teach us how great was the nation whom we once called barbarian, though their history, their name and race can now only be conjectured. Between the Treasury of Atreus and the Choragic monument (an example so small as hardly to be quoted except as a connecting link) there is a gap of 1000 years—a space which contains the lifetime of a nation—sees its rise and its decay; and yet amidst the buildings, the sculptures and the vases whereon so much of the nation's character has been written, I cannot recall one instance beyond those that I have mentioned to

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show that the dome was ever used by the Greeks; that nation whose fertile mind teemed with inventions in art, in poetry, in everything, I am heretic enough to say, but in architecture. For beautiful as their one form once was, and refined in detail to an extent that we can scarcely yet appreciate, the form was still one, which, varying only in detail, might have served as the model of nearly every temple from Pæstum to Ionia.

The tiny monument of Lysicrates is interesting so far as, were we disposed to trace art forms up to their earliest source, it would offer the first instance of a dome, raised on columns, and showing the domical form both inside and out. This monument is of singular beauty, but it can now, perhaps, be better judged of casts and drawings than from the reality. For it is (or was a few years back when I saw it) half buried in rubbish and filth, and to be approached only through a nest of squalid hovels. Another jump of some 500 years brings us to a number of examples, showing the outline of the dome almost perfected—at Rome the Pantheon, the Temples of Venus, of Minerva Medica, and the Baths of Caracalla—at Baiæ the Temple of Venus—at Pompeii the Baths, show us the form developed, while the grandeur of many of those examples still left teach us how very many we must have lost. In some small remains at Mylassa in Ionia, of perhaps earlier date than the above, the Greeks made a great advance by covering a square space with a domical structure, and raising it on columns by a method which has been well described by Mr. Fergusson in his Handbook, more especially in reference to Indian domes. This method is the one that we might expect would be first adopted, and consists simply in covering the angles of the square with a flat stone or girder, then repeating the process and thus gradually obtaining a near approach to a circle. At Mylassa the arrangement seems to have been well managed, and to have produced a very pleasing effect. In the Indian domes the arrangement was still more picturesque; but the whole must, I think, be considered as a rude way of getting over a difficulty. We have an example of 1000 years later date than that at Mylassa in the Temple of Pandrethan in Kashmir, but formed on precisely the same principles. I remember but one instance of its use in an interior in modern times, viz. at Sta. Balbina at Milan, where the angles are cut off in the most abrupt manner, and the effect is disagreeable in the extreme. But a remarkable instance of its use externally may be seen in Palladio's celebrated villa Capri near Vicenza, where the dome, with a low stylobate under, is placed directly on the square hipped roof—not raised above it as shown in the engravings, but sunk into the sides in the most awkward manner. At Mereworth Castle, Kent, this example has been copied, without the cutting into the roof, which is better, but with a higher dome, which is decidedly worse. The external effect of this abrupt change from the square to the circle could scarcely be pleasing anywhere, and it is surprising to find that we must look for the most numerous examples of its use amongst the picturesque churches of elegant Palermo. No effort is there made to conceal the transition, and the effect is certainly unpleasant. There are some examples also at Cairo and Ancona, but the change is there softened by an octagon being interposed.

The next attempt to get rid of the harsh effect of the horizontal angular pieces internally would be, we may imagine, to fill them up by a slanting projection starting from a point at the base, each filling-in piece being triangular. Yet this is by no means the earliest in point of date, and very few examples of it in its simple form as applied to interiors exist. The best specimens are, perhaps, to be found in the French churches of Loches, Uzerche, &c., so well described by Mr. Petit. But the honeycomb pendentives of the Saracens, seen in the Mosque of Hassan at Cairo, the Cuba at Palermo, and the Pathan Mosque at Delhi, may be ranked in the same class as a beautiful variety. The transition externally from the square to the round may be made in the most ready way, by merely slanting off the angles; by which simple expedient a very beautiful outline has been produced by the Arab architects, as will be at once seen in the well known tombs at Cairo. The same expedient has been sometimes used in later times, as in the well-known villa at Chiswick; but considering the picturesque effects which the Arabs have proved can be produced by this easy plan, I must say I wonder that it has not been more often adopted—more especially as the Gothic architects have shewn in many a beautiful example, in their spires, how picturesque the connection between two dissimilar forms may be made. Somewhat of this treatment may be seen in the dome of Ani in Armenia; but I cannot help regretting that the Gothic architects did not adapt to their own forms that of the dome, and complete the beautiful beginning made towards it at Ely. The next change would be probably to support the angular filling in by an arch; and at Serbistan we see this arrangement complete. It is, indeed, so strikingly like the Arab forms of 800 years later, seen in Palermo, that we hesitate at first to assign it to the fourth century. But we have good authority for so doing, and indeed the remains now disinterred in the East shew us how little is our present knowledge of its art. Who for instance, looking at the battlemented turrets and round arched dome of the Assyrian sculptures would, not knowing its date, venture to assign its real one? Or who would consider the Temple of Payach, in Kashmir to be of the age of Theodoric, or the pointed arch at Bisotoum to be of the fifth century? and yet we have excellent authority for these conclusions. And, indeed, changing in all else, the East retains its art traditions almost unchanging; and the art workman there produces his tapestry and mosaics after the same likeness as his ancestors have done for centuries before him.

The models at Serbistan and Ferouzabad however, if followed, seem to have left few immediate copies, and for many a year after we see no trace of their influence. In Italy we now find the great circular buildings of Nocera, Sta. Costanza, &c. All these seem to have been formed on one plan; the builders got some old columns on which they put as many old capitals as they could find, without much regard to size or form. A tall base made amends for a short capital, and where capitals and bases enough were not found ready made, others were worked out in rude similitude. The columns being ranged in circles, a drum was carried up over them, and a large dome covered all; yet, rude as is the whole arrangement, there is a picturesque and quiet effect in the mass that is very pleasing.

Of a somewhat later date is the well-known tomb of Theodoric at Ravenna, as picturesque in effect as bold in construction. A dome of 35 feet diameter in one solid block of stone, hoisted some 50 feet in the air, would startle a modern mason; but though its foundations were, when I saw it, under water, scarcely a fracture could be seen throughout the building. Were not the date of this also well authenticated, we should hesitate to place it where we now do.

Another method, more scientific, and perhaps more artistic, took the place of that of Serbistan. If we round off the top edges of these exterior angular gussets to the form of the circle in elevation, we shall have externally the Byzantine form of pendentive. But the Eastern architects seem to have worked out the form in a different way, best described by Mr. Petit.*

Externally the Western dome corresponds in diameter to one side of the square on which it is described, but in the Eastern the diameter is often equal to the diagonal. Try this on the model and see if anything can be more unpromising in outline than the huge overhanging on each side of the square. But cut off this projection and see how picturesque is the result. On a square, on an unequal sided figure, on a polygon, the result is the same, and I believe that no more picturesque outline was ever invented. From its earliest use down to the present time—as exemplified in the beautiful Indian canopy exhibited at the Crystal Palace of 1851, this outline has supplied forms of beauty throughout the East.

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* Architectural Studies in France.

To individualize the specimens of this form, for the first idea of which we are, however, indebted to the Romans, we must begin with Constantinople. The earliest church there (Agios Sergios) has much in plan resembling the Temple of Minerva Medica at Rome, and its picturesque arrangement of columns might once have existed in its prototype. But in the next example, the celebrated Sta. Sophia, we have the Byzantine pendentive clearly worked out between lofty arches and supporting the dome above, with an outside ring of arches added, shadowing forth, perhaps, the later mode of the circular peristyle.

On S. Vitale, a work of the same Emperor, I need not dwell, as its picturesque form is known to all. But at Agia Theotokos, at Constantinople, a very important novelty was introduced in the external treatment, and very worthy is it of notice. It consists in carrying out the outline of the internal arches where they cut the dome, ornamenting them with massive archivolts carried on marble columns, and thus breaking up the base of the dome by a wave line in place of the level cornice.

There are a few examples in the West of Europe. The exterior of the S. Aposteln, at Cologne, is a very good specimen, though the internal arrangement is like that described for Serbistan. But in Greece, the form is everywhere met with as a native style; and the churches, springing as they do from the square to the cross form, raised in the centre by these domes, and coloured in the boldest way by the use of marble, brick, and terra cotta, have an effect scarcely to be imagined.

I would here give a few minutes investigation to a church which deserves, I think, most careful examination, S. Ciriaco, at Ancona; an architectural work fine in itself, and occupying a site not to be exceeded for beauty. It is evidently the work of many ages and bears the mark of many changes; it has met with unscrupulous restorers, who yet have left enough to tell the tale. In a case like this we feel the want of such a guide as Willis has been to several of our own cathedrals. In Italy many a patient antiquary has written the history of these old places carefully and well. Fabri has worked hard for Ravenna, Severano for Rome, and Maffei for Verona, but they all worked from books and not from the stones themselves. They have not traced, from the change of style, of moulding or of masonry, the various works of the various builders, and there are few of us, I am afraid, who can afford the time to do so on the spot for ourselves. Now here as an instance, D'Agincourt and Serra di Falco gave 950 as the date, while Milizia names about 1,300, and assigns it to Marghettone of Arezzo. I have no doubt whatever that the local tradition is correct, and that, next to S. Vitale, it is the most ancient dome in Italy, whilst it ranks first for being on detached piers. But it was largely altered in later times, and Milizia's date applies to them. This is borne out by an inscription in the church of the Misericordia in the same town, where the date is recorded as shortly after 1349, and the dome is a clumsy copy of S. Ciriaco. The latter is built on the plan of a Greek cross, each of the transepts being raised seven steps, with a chapel under. The walls of small square stones are unplastered, all the arches circular, and the aisles groined. At the intersection of the cross is a dome resting on a curious pendentive, half Byzantine, half arched, and worked as though by a novice at the craft, for the lines of masonry, instead of keeping to the circle, run into each other between the arches at a slight angle. Above these is a high drum, and above that a dome, both being twelve sided inside and out, but carried upon a series of ribs converging quite in the Gothic system of construction and of form. The beautiful porch is clearly a much later addition to the church, and I have no doubt, the work of the 14th Century. But I am inclined to think that all the dome is of the earlier date, and if so the church has a right to a higher rank in the scale of art than it now has. The ornamentation throughout is very curious, and the church is altogether worthy of a much more careful study than I had time to give it. One other point about it, however, deserves attention. The dome is finished with a small lantern, an addition which at once suggested, and indeed required, a great change in construction and arrangement. In the ordinary form, where no weight had to be supported but that of the dome itself, the construction adopted was of a boldness scarcely to be imagined, and the tenuity of the section, and the lightness of the material (the dome of S. Vitale, for instance, being of pipes only) show how much more easily this beautiful form of covering can be used than is generally thought. When, however, the lantern was added, a change became at once necessary to support the extra weight. At S. Ciriaco there is a series of ribs in addition to the thick covering itself. At Bergamo the thickness of the dome is increased. But in later times and with larger domes, a double covering (as seen very clearly at Florence and at St. Peter's) was used, and by this means, the external form of the dome often became quite different from the interior and much more nearly approaching the cone. Up to this time, also, the dome, in Western Europe at least, seems to have been treated almost entirely with regard to the internal effect, its exterior, with few exceptions, being left unornamented and bare. But there are few churches of later date in which this feature was not as carefully finished externally as the rest of the edifice.

The next example worthy of note is Sta. Fosca, at Venice, where the dome is unfinished; but the plan is one of much beauty and the pendentives are arranged with great elegance. Were this church completed, I know no building that would exceed it in beauty of outline, or be more worthy of imitation, if imitation there must be, for our present form of worship. Of St. Mark's every detail is so well known that I need not dwell upon it. Altered as the church is, and added to in later times in a way that must overturn all our ideas of correct restoration, there is a spell in the old building that more chaste forms cannot excite; and were the windows that now admit an unsubdued glare toned down by colour, the interior, in effect, would almost exceed the imagination. Outside, it seemed to me that, whether by the gorgeous light of day or the softer gleam of night, the Piazza of St. Mark, of which this forms the most striking feature, is unsurpassed in beauty.

The church of S. Tomaso at Bergamo now succeeds, in which the lantern has become an important and massive feature, and the old plan of hiding the external form of the cupola by a sloping roof is revived after a sleep of some 600 years. Since the time of the Roman Baptisteries the dome had shown its own honest form inside and out in nearly every instance, but now we have it used merely as a vault covering inside, whilst the exterior shows no more trace of it than our Gothic high pitched roofs do of the groined vaulting they cover. The reason of the change is worth inquiry. These workers of old seem to have been too earnest in their work to alter merely for the sake of altering. They had the same climate, the same materials, I think the same skill, as their fathers, and when the interior vault was turned, the main difficulty was gone. The remains of the vaults of Minerva Medica and others, standing wherever stand the walls on which they rest, show that time does not destroy them more than other forms of covering. Was it that the part between the springing of the dome and the eaves of the roof gave space for the picturesque arcade so beautifully worked out in the Rhenish churches? Whatever the motive, those who have studied in the cities of the Rhine can scarcely regret the change. This roof cover seems to have been very general about this time. We find its form most picturesquely developed in Germany, in Italy, and even in Armenia, where the tomb and cathedral of Ani and the church of Dighour excite our admiration.

But, amongst the Arab workmen in Egypt and Sicily, the old form continued in use, and it is to this date that we owe the beautiful interiors of the Mosque Barkauk at Cairo, and of S. Giovanni, S. Simone, and the Capella Reale at Palermo. The church of Agia Theotokos at Constantinople, those of

Ani and Dighonr, and that of the S. Aposteln at Cologne, may boast of having been almost the only ones to this time where the tambour was made ornamental, and the dome and substructure were thus brought into one harmonious whole.

Our next great example is the Baptistery at Pisa, where the dome is so utterly false, inside and out, that the whole must be looked upon as an exceptional case, not to be classed or reckoned ; while the great Baptistery at Florence, beautiful as it is, has been so altered, and the times of the alterations are so doubtful, that its date can scarcely be fixed. The Baptistery at Parma is of clearer date, but I doubt if the upper range of arches which screens so falsely both dome and roof, is coeval with the building or part of the design. I thought not when on the spot.

The next is Brunelleschi's great work at Florence. But before beginning the sketch of these later works, I would devote a short time to consider some other detached specimens of the Mediæval age in Germany and France. In fact, in thinking over these memorials of a by-gone time, we feel the same regret as in roaming through their aisles and cloisters. There is a fascination about them which time will not, I fear, ever give to those of later date. St. Peter's and St. Paul's, and Sta. Maria at Florence, may astonish us by their greatness and their grandeur, but I doubt if our descendants will ever pass with such solemn feelings through them as we do now through the aisles of S. Ambrogio, at Milan, or the cathedrals of Mayence, or Lincoln, to which I think those magnificent lines of Byron could be better applied than to St. Peter's—

"Enter. Its grandeur overpowers thee not,
And why? It is not lessened, but thy mind
Expanded by the genius of the spot
Hath grown colossal."

That this difference in the feelings caused by the earlier and by the later works exists is certain. It were too long now to analyze it. In the churches of France, at Blois, Loches, Uzerche, Perigueux, Angouleme, and other towns, we find a series of domes of the most picturesque forms, of all classes and of the boldest construction. The details have been well illustrated by Mr. Petit, and each of these churches is worth a careful study. At Ratisbon, the Baptistery, a small building of uncertain date and of a picturesque plan, has an arrangement of pendentives which combines the Byzantine and the arched system, and has a very good effect.

In all these works I have not, I believe, found any construction but that of brick and stone; timber does not seem to have been used. Yet the bold roofs at Padua and Vicenza show what the men of old could do, when they willed. We must now bid adieu to them and come to those whom we must rank as moderns. And, truly, there have been giants even in these days; for the changes made in the form and treatment of the dome by modern architects have made it a new feature. Of all these great men, I reckon Brunelleschi as the first, in rank well as in time. The cathedral of Florence would be, perhaps, enough for his fame, but the beauty of proportion and details in S. Spirito, S. Lorenzo, and Degli Angeli, bear witness to it, perhaps, still more.

Yet even with him the dome is in one case concealed by an external roof, and in the other, only timidly shown. The cathedral has its dome still unfinished, and not until all is done as he designed it, can its beauty be appreciated. The large cornice at the base has but one side finished; the small arcade at top is in the same state, the naked bricks show where the marble should, and tiles, as a covering to the whole, impoverish the look. The Roman who covered his Pantheon with bronze would have laughed at the change, and those who complain of want of zeal in the nineteenth century, may think of what was left undone in the fairest city of the fourteenth.

For St. Augustin's at Rome, D'Agincourt claims the credit of having the first dome elevated upon an ornamental high tambour; but the Armenian churches certainly forestalled it, and the polygonal finish to S. M. delle Grazie at Milan may rank with the works of any time, for beauty of conception, both in outline and colour. Between this and St. Peter's comes the beautiful church of S. Andrea, at Mantua. But I am afraid that the dome, which forms so fine a feature, must not rank as Alberti's, but that it is of a much later date. St. Peter's succeeds, and with it comes the use of that marked feature of nearly all the later domes, the peristyle of the tambour. So far, I believe, as our knowledge extends, this was the creation of Bramante, an architect as bold in conception as delicate in his details. This peristyle forms the most prominent object, both in his design and in that of Sangallo, where it is at once carried almost to extravagance. Michael Angelo's design is, perhaps, more simply grand than that of either of his predecessors, but I must say boldly that the outline of our own St. Paul's excels them all, and that I know nothing to exceed the exquisite proportions of its form. St. Peter's has its noble colonnade, and, in the Vatican and its Loggie, accessories, of which we cannot boast. But its dome starts from the general line as if unconnected with it, and almost as if sunk in it; the splendid view, so well known to all, of its great front and immense piazza, is taken from an imaginary point, and is one which never can be realised, unless some hundreds of houses are destroyed. And in the Eternal City houses, and aught else standing in the way of improvement, are much more likely to be carefully preserved. Now St. Paul's, seen closely as it is, shows itself clearly as a mass, with the dome springing from it and rising out of it without effort, and as part of the whole: and, if ever it shall be seen clearly from a wide opening in any quarter, our fellow-citizens, who know not architecture, and who have all their lives seen, perhaps unmoved, this noble work of Wren, will find for the first time that they have a work which, at least, rivals the greatest of other capitals. Palladio, in his St. M. della Salute, at Venice, has boldly used another method, and nothing, perhaps, on that site could be happier in effect. He resists the apparent thrust of the dome by huge consoles, which he renders ornamental by making them pedestals for statues. In another great work of his, the Redentore, there is a curious perspective effect. The dome is stilted up for about a quarter of its height, without any moulding or set-off, and the result is that, both in reality and in drawings, it appears to bulge very much at the springing.

Wren, in his St. Stephen's, Walbrook, has produced a church of striking originality and beauty, and no form, perhaps, of the style, could be better used for our churches. We may too, in London, boast of two modern domes, at the Coal Exchange and at the Museum, whose novel construction in respect to material, has been very successful, and whose outline, mode of lighting, and decoration give them a high rank. At Rome, the churches of SS. Trinità dei Pellegrini, S. Andrea al Quirinale, by Bernini, and S. M. Lauretana, by Sangallo, deserve attention. In more modern times, the Basilica of Sta. Francesca, at Naples, by Bianchi, has been crowned with a dome of 12 feet greater diameter than St. Paul's. At Paris, the French may boast of the iron roof of the Halle-au-Blé, of the domes of the Pantheon, the Val-de-Grace, the Invalides, and the Sorbonne. But, except that of the Pantheon, they are not remarkable for elegance. Russia lays claim to more attention, and the recently erected church of St. Isaac at St. Petersburgh has a dome treated in a novel, and seemingly, successful, manner

I must now notice a few specimens of eccentricities, merely to put them on record. In Sebastian Serlio's work there are several designs for domes, oval on plan, and, in several places, the idea has unfortunately, been worked out. The most notable examples are the Cathedral at Pisa, and the two churches at the end of the Corso in Rome. At Pisa, from the situation and accessories, the defect is not so much noticed; but, in the twin churches at Rome, each presents—except when seen directly in front, or at the side, a different outline from the other, and the result is as unsatisfactory as can be imagined. Internally, the effect is not so bad, and, in several instances, quite the reverse. At the church of Ara Cœli, at Vicenza, for instance, the plan works out well; and there is one at Rome, I think, by Borromini, equally satisfactory. As curiosities, or monstrosities, as you like, I may instance the Eastern domes of the mosque at Tabriz, the Taj Mehal at Agra, and a dome at Ispahan, where the bulbous form of the exterior swells out beyond all concord with the interior, and every principle of construction, and, I think, of beauty, is sacrificed to a wish for novelty. To go into all the varieties of form would be a useless task. They range from the steeple-like dome of S. Leonard at Frankfort to the flattened top of the Four Courts at Dublin, a building which, by this false outline, has just missed being one of the most pleasing and picturesque in the kingdom.

A few words as to lighting and decoration. I cannot but think that, however well a dark and gloomy effect may harmonize with the object of the church, yet, if the building itself be well lighted, the dome should be so too. To arrange this, I know no way more simple than the central light of the Pantheon. But other methods have been successfully used, and, as at the Minerva Medica, or better at Nocera, and best at Serbistan, the light has been admitted through many small openings in the dome. To leave the dome in darkness is to lose its whole effect, and to make it of no more value than the roof that I remember in a country town in Italy, where, at the springing of an unfinished dome, the flat roof was so hidden by being painted black, that it had all the appearance of a dark vacuity. A very picturesque way of lighting may be seen in the small semi-dome behind the altar of S. Sulpice at Paris, where the light enters from behind a large cornice, whose projection conceals the source. A large cornice of this sort is introduced, with excellent effect, in the church of Monte Berico. This church offers, too, one of the most notable instances of slight piers that I remember.

For decoration, I know nothing to equal in effect the old mosaics. Their richness of colour, and the splendour of the gilt grounds which give grandeur without gaudiness, make them unequalled, and the treatment of the figures and scroll-work is never such as to break up the general outline The whole seems to form part of the general design, and not to break the sweep of the dome in any way. This art is certainly not progressive. At St. Peter's, indeed, the modern mosaics tell extremely well, but they are of the most simple kind, and where elaborate effect is tried, as at St. Mark's, the result is painfully inferior to that of the old. These later artists put in pictures, when what was asked for was decoration. In later times still, some perhaps of the most successful attempts have been made in the beautiful Genoese churches, where the artists have, as it were, identified themselves with the architect, and produced work which harmonizes with his. But whatever the style of decoration be (and I say it with all the diffidence becoming a junior member of the profession), I am sure that any style must fail which, carried out like Thornhill's at St. Paul's, breaks up the beautiful contour of the dome with columns and arches, and other forms utterly foreign to its outline.

In reviewing the whole subject, the most inveterate admirer of the Middle Ages (and I confess to being one myself) must, I think, admit, that the dome owes much of its grandeur to the moderns; and, admiring as I do the picturesque effect of the Greek churches, I cannot help thinking that I would scarcely exchange the majestic dome of St. Paul's for theirs. I know its waste of space—I know that one half of it is, inside, a dark mass, encumbered with timber and with brick-work, and I know that the others are small because they tell their story truly, and show without what they are within. But the peristyle, the lofty dome, and its grand lantern, have a look of majesty that defy its rivals, and almost reconcile us to all its faults. And in the days of old the architects found at St. Mark's the same want that Wren did, and supplied it in the same way.

One word more.—Of all these glorious works that we have reviewed, who were the authors? Wren we know and glory in, and Angelo, Brunelleschi, and the architects of Sta. Sophia are household words to us. But of the multitude of other works which are spread over the land, who were the workmen? whence came they, and where did they learn their craft? It was no common skill that poised the stones at Mycenæ to last 3,000 years; that raised the fragile coil of pipes that has crowned S. Vitale for thirteen centuries; and that spanned the Pantheon with a dome not yet surpassed!

But of all the thousand pilgrims who gaze delighted on these works, how few give a thought to their authors! They were of us—proud may we be to say it—and well could I wish that the glance of modern scrutiny, that has searched so deeply into the cloudy past, could open out to us the names and history of its guiding spirits, and let us know somewhat of the workings of our brethren of old, who have left behind them only their great works—

"Footprints on the shores of time."

At the request of Mr. Bunning, V.P., Chairman, Mr. Carpenter, Visitor, gave some explanation of an interesting set of drawings made by him representing temples and buildings in Kashmir and Northern India. The roofs, pyramidal externally and domical inside, were formed of two solid blocks of stone, the internal dimensions 15 to 16 feet square. No scaffolding appeared to have been used in raising some of these structures, the materials having been moved up the incline of a mound of earth, which was gradually increased as the work proceeded, and the building, when finished, was enclosed by it on all sides till it was removed. An example was still to be seen with the materials resting on the mound, the works never having been completed. Full particulars of these temples would be found in a paper by Major Cunningham, in the Journal of the Asiatic Society, 1848.

Mr. G. G. Scott, V.P., said that the introduction of the dome into Gothic works had been considered a great desideratum. From his own studies and attempts to effect it, he should say that the dome suited the Gothic as well as any other style of architecture—the great difficulty, however, was to make it harmonize with the high pitched roof. In the abstract, it seemed that the dome could not be made to afford a satisfactory result both in internal and external appearance, as in whichever particular it succeeded, it would appear on the other either too high or too low. Perhaps the Byzantine dome of Sta. Sophia might be considered the correct one for inside effect, but its external appearance was flat and unsatisfactory. If raised up to tell externally, the inside effect would be injured, besides the additional expense of the costly stone work. To introduce the dome in Gothic architecture effectively. we must endeavour to overcome the difficulty occasioned by the transepts and high roofs abutting against it. It was not to be expected that the use of the dome could become general, as the great cost would be an obstacle; still, attention should be paid to it, in order to introduce, where feasible, so magnificent a feature both in the interior and exterior of buildings. In civil buildings a perfect interior might be obtained in the dome, and in buildings detached or without wings a happy result both internally and externally might generally be looked for; thus the whole elevation of the Baptistery at Florence was satisfactory and the interior effect very fine; but in the Baptistery at Pisa, though the exterior shewed a domical form, the interior presented a mere cone.

Mr. Edwin Nash, Associate, said that the fashion for building domes seemed to have been set by that of the Pantheon at Rome, the earliest and still the best, both internally and externally. The other Roman examples of Minerva Medica, Vesta, the Mausoleum of Augustus, &c. seemed to have been constructed within a few years of the Pantheon and during the Augustine age, shewing how soon the example had been followed. In point of construction the dome was one of the easiest in architecture, particularly when raised on a circular substructure as at the Pantheon. The modern contrivances to lighten the mass of material, as the hollow pots used by Sir John Soane at the Bank of England, &c. appeared to him unnecessary—so simple was the operation in itself as to require none of those appliances. A discussion on the construction of domes would be highly interesting.

Mr. M. Digby Wyatt, Hon. Sec., alluded to the dome proposed to be constructed with wrought iron, 200 feet in diameter, for the Exhibition Building in 1851; and Mr. Lewis gave some detailed explanation of a very large working drawing of the iron ribs and standards used by Mr. S. Smirke in the new circular reading room of the British Museum, 140 feet in diameter and 105 high internally. Mr. Digby Wyatt observed that in Eastern domes the use internally of geometrical figures, diminishing upwards as the space contracted, was more satisfactory than the hacknied repetition with us of the monotonous vertical rib. To meet the difficulty, mentioned by Mr. Scott, of ensuring a good appearance both inside and out, perhaps colour applied internally might be found a valuable assistant, when the exterior had been constructed of the most satisfactory form. But under no circumstances should the decoration, of whatever description, be such as to interfere with the grand feature of curvilinear outline in the dome.

Mr. Scott agreed that airiness of effect might be obtained by the proper use of colour. But in decorating the interior of domes, as of other structures, the treatment should be of a flat and uniform style, so as not to disturb the structural form of the dome itself.

Mr. Papworth, Fellow, could not refrain from vindicating the architect of the Four Courts, Dublin, from the strictures passed on that work, which was but a faithful transcript, so far as the domical covering was concerned, of the much admired Pantheon of Agrippa. With reference to the charge brought against many domical buildings, of much space being wasted between the visible interior and exterior, the same objection might be alleged against Mediæval spires, the whole interior of which was often invisible, generally even to the bell-ringers. Examples were put forth in Mr. Lewis' paper as domes, which he held to be improperly so denominated—voussoirs radiating to a common centre throughout, and not simply concentric horizontal rings being the vaulting essential to the constitution of a cupola, or a dome Inattention to this particular, and trusting to the mere force of cohesion of the cementing material employed in the construction had probably led to many failures in Indian domes of recent date, which English engineers had been called in to rectify.

Mr. Lewis explained that his remarks on the dome of the Four Courts, Dublin, were directed not so much against the domical covering itself, as against its obvious want of harmony with the leading vertical outlines of the very lofty tambour on which it was placed.

Mr. C. H. Smith, C. Visitor, believed that the dome at Florence was hardly inferior in size and arrangement to the Pantheon at Rome; and he considered the complicated mode of construction shewn on the drawing of the latter building, in which the thrust was merely transferred from one small arch to another, and ultimately to certain parts at the base, the dome being 5 to 6 feet in its least thickness, as inferior in scientific skill to that shown in the section of St. Paul's, in which the brick cone supporting the lantern crowning the whole was only 18 inches thick. The so-called loss of space in that dome he considered essential to the good effect of the whole building, viewed externally as well as internally. The iron construction which had been alluded to, might he believed be extended to domes of much greater span—even to 500 feet. Telford the Engineer had been taunted for projecting the suspension bridge over the Menai Strait of 560 feet span, but the result proved the correctness of his views, and bore out his playful observation that a loaded waggon would produce no more effect on the bridge than a fly settling on a tape yard measure stretched horizontally.

Mr. E. Nash, notwithstanding Mr. Papworth's dictum, thought that a dome might be constructed of horizontal rings without any centering, at any rate for more than one half its height from the springing.

A Member alluded, in support of this opinion, to the arch constructed without centering by Sir M. Brunel.

Mr. Ashpitel, Fellow, thought that domes were used and understood at an earlier period than had generally been supposed. That the Odeum at Athens was so covered, might be inferred from passages in Greek authors. Cratinus compared the roof of the building to the peculiarly shaped cranium of Pericles. The word Tholos, used by Homer, referred probably to the whole of a building; and Vitruvius, as a Latin author, did not explain the meaning. In the Pantheon a novel mode of construction first became apparent, viz., converging ribs of brick, the spaces between filled in with lighter material. The same still remained in skeleton in the ruins of Minerva Medica, a proof of its strength and durability. And these were prototypes of the great iron construction, recently carried out at the British Museum and the Coal Exchange. The Hindostanic domes would seem on the contrary to be built in horizontal courses, but that construction presented the obvious disadvantage of requiring an immense mass at the springing to counterbalance the leverage of the upper part. Though the earliest Roman domes exhibited the rib and panel system of construction, later ones were formed of continuous masses of masonry. The question of thrust was one requiring attentive consideration, and Brunelleschi, at Florence, had displayed great skill in making the covering cellular, and so of two thicknesses, by which he had consequently obtained great comparative lightness, and freedom from crushing at the base. Like the dome at Florence, that of St. Peter's at Rome was a real one of construction both inside and out; but though St. Paul's and the French examples differed from them in this respect, and in the space apparently lost between the interior and exterior surfaces, the right to employ certain artistic licenses in design must not be denied to the authors of the last named buildings. Mr. Ashpitel proceeded to give an account of the present dilapidated state of Palladio's celebrated Villa Capri, the main feature of which, the dome, was executed in a manner different from and inferior to that shown in the engraved views of the building. The theory of the construction, thrust, equipoise, &c. of the dome, differed essentially from that of the ordinary vault and arch, and the whole subject still demanded careful scientific investigation.

Mr. Papworth remarked that Mr. Lewis Vulliamy had introduced a mode of lighting a dome in Mr. Holford's House in Park Lane by numerous openings in the surface, besides the central eye, which Mr. Vulliamy considered would produce a very satisfactory result.

Mr. Charles Fowler, jun., Associate, repeated a remark of his former instructor, the late M. de Chateauneuf, that domes should be lighted from below, and not from a central eye. This he considered applied most correctly to those decorated like Sta. Sophia, with coloured mosaics, which would be indistinct if lighted from above. The charge of untruthfulness made against the use of several domical vaults, placed one over the other, in some modern examples, he considered unjust, as they all were seen to the extent required, and so fulfilled the respective purposes for which they were obviously constructed.

A vote of thanks was passed to Mr. Lewis for his paper, a development of which, embracing the theory of the construction of domes, the Chairman invited him to supply at a future meeting.

A SHORT NOTICE ON STAMPED OR INCISED STUCCO,

Communicated to the Ordinary General Meeting of the Royal Institute of British Architects, June 15th, 1857,

By B. Ferrey, Fellow.

I wish to call the attention of the members to some specimens of stamped Stucco, from which I think it may be seen that it is possible to obtain large surface decorations at a small expense, and that a common material, which has hitherto in modern practice been only used for perfectly plain purposes, may be made the means of much successful enrichment. My mind was first directed to this matter by a desire to obtain some sort of suitable ornamentation for the interior of churches built at small outlay; for it appeared to me that when every effort was making to render churches both solid in construction and beautiful in material, by the use of costly marbles for walls and polychromatic devices for internal wall surfaces, there should be some attempt (where economy in cost was obligatory) to employ common products in such manner that in their natural use they should conduce to church-like effect, without adopting those surface embellishments which, in their application, become necessarily expensive.

Much attention has properly been given to a better use of bricks for Ecclesiastical buildings, and good effect has been produced by them with stone and flint; naked brickwork, however, for the internal facing of walls is less successful, and the usual way of obtaining durable surface decorations is by painting upon metal plates and affixing them to the walls. With many people, however, there is a strong dislike to polychromy. They will sanction any extent of neutral tint or bi-colour, but object to having coloured decorations, however well executed. This may be, and probably is, a mistaken view; but the prevalence of the opinion is a "great fact," and must be dealt with accordingly. Any kind of enrichment, therefore, which can be produced in the plaster, and is consistent with "true principles of Mediæval art," is worthy of notice. Anything affecting to be what in reality it is not should be excluded from use in churches, where truthfulness ought to prevail. Plaster is therefore very properly forbidden to be used for columns and arches, or any constructive members which ought to be of stone or some other rigid substance.

In former times the plastered walls of our churches were covered with coloured devices and texts, or illustrations of scriptural subjects; entirely plain surfaces were seldom to be found; but in later periods a Puritanical spirit prevailed, which led to the concealment of all these decorations by repeated coatings of whitewash. Happily a more enlightened feeling now exists, and there is a general desire that our churches should be suitably ornamented; indeed, nothing hinders decoration but the want of funds, and in all modern churches there is a seeking for some economical mode of enriching the internal wall surfaces. A very cheap and simple mode of ornamentation seems hitherto to have remained unattempted. It is well known that the external rough casting on old wooden buildings was stamped or wrought in small devices, known by the term "pargetting," but it never assumed the importance of extensive wall decorations, as when stone and brick entirely superseded the use of quartered oak framing the system of pargetting also ceased. There seems no reason, however, why this principle of design should not be largely used in another way. The plan now proposed is to impress the common stucco with geometrical and other forms,—they may be applied according to the taste of the architect, either under string-courses, around arches in spandrils, soffites, or in large masses of diapering, and texts may be imprinted on the plaster instead of being simply painted on the walls. If colour is desired, it can be effected by mixing the desired colour with the coat forming the groundwork, then by laying the stencilled pattern against it, and filling in the solid portions of the device with the ordinary stucco or plaster.

It will be observed that I have used the word stucco in this description and not plaster; it is not, however, to be supposed that this process cannot be used with fine plaster or any cement which does not set too rapidly. My object is to show that the commonest material is capable of being employed, and that it may be impressed "in situ." If common stucco, therefore, may be thus treated, it shows what opportunities are open to us for giving interest to large wall surfaces which are generally left plain.

My bringing this matter before the members of the Institute is simply with a suggestive view; each person will judge for himself as to the particular way in which it may be applied. The cost of making the brass patterns is not expensive, and there is no reason why fresh designs should not be made to suit any building,—thus the frequent repetition of the same ornaments would be avoided. This should not aim at superseding any higher mode of decoration; but that it may be made conducive to good effect in the interior of buildings, I can entertain no doubt.

A SHORT ACCOUNT OF SCOTT'S PATENT CEMENT,

Communicated by Capt. H. Y. D. Scott, R.E., June 15th, 1857.

Whilst experimenting, in the spring of 1854, on a lime possessing feeble hydraulic properties, I, on one occasion, placed a piece of the limestone in a dining room fire, and then left it for a few hours to calcine it. In the meantime some economically disposed person smothered the fire with cinders and dust from the hearth, and on my testing the lime with acid to ascertain if it was properly burned, it effervesced so violently that I again returned it to the grate. But, now, the fire could not be made to burn brightly, and on a second trial it effervesced as much as before. Somewhat impatiently I rubbed the lime to a powder, to assist the slaking, mixed it with water, and waited in expectation of seeing the cake I had made crumble to powder, but, much to my astonishment, it gradually solidified, and at the end of twenty-four hours would not yield under the nail.

After many attempts, with coke and coal to produce similar results on a manufacturing scale, I ascertained that the phenomenon was, in some manner or other, caused by the sulphurous acid generated from the fuel, and this led to the process now adopted.

This process consists in subjecting quick lime, which has been raised to incipient redness by the combustion of ordinary fuel, to the fumes arising from sulphur burned with a limited access of air. A small amount of sulphate of lime is thus formed, and to this cause, apparently, the extraordinary change produced in the lime is to be attributed. It now no longer slakes, in the ordinary sense of the term, and when ground to powder and used as a cement, it not only forms a very cementitious mortar, but affords a very cheap, beautiful, and durable coating for walls, whether used internally or externally.

The ordinary method of coating walls internally is open to many objections.—

1. Lime and hair plaster often blisters from the use of imperfectly slaked lime.
2. It always opens in unseemly cracks from unequal contraction in drying.
3. A long period, varying with the season of the year, must elapse between the application of the several coatings, involving serious loss of time and inconvenience in moving scaffolding.

4. A very long period must be allowed before the walls are papered and painted.
5. It never becomes sufficiently hard to resist a moderately heavy blow, such as may be given in moving furniture, &c.

From all these objections the new cement is free. It neither blisters nor cracks. It sets with sufficient rapidity to allow the plasterer to follow on with the finishing coat without loss of time, and therefore the expense of moving scaffolding is avoided.

A room can be papered and painted as soon as finished, excepting in the winter time, and then as soon as the walls can be made sufficiently warm to prevent the deposition on them of the moisture of the atmosphere.

And to all these advantages is to be added that of costing, if laid on half an inch thick, 20 per cent. less than the ordinary material.

For exterior coatings, the Portland cement is now generally used, and if well made and properly treated, this cement leaves nothing to be desired in point of hardness. But objection is constantly made to the great variations in its colour, and, indeed, it is impossible to get two supplies, or even two casks, of precisely the same tint. Very frequently, one portion of a house shows of a bluish white, and the remainder, by a well marked line of separation, of a leaden blue or dirty brown. Scott's cement, on the other hand, is always of the same colour,—the agreeable light buff of the magnesian lime stone,—and any variation of tint that shows itself after application is of a nature to increase its resemblance to it. At the same time, at the expiration of a week, it can compete with the Portland cement in hardness, and the saving effected in the materials used in stucco work is not less than 30 per cent.

The only precaution necessary to impress on workmen in its use is that which is necessary with all cements, and the neglect of which so frequently brings undeserved expense and abuse on the cement manufacturer. I mean a thoroughly wetted wall for the rendering coat, and still more a thoroughly wetted rendering coat (if the setting coat is not brought on at once, as it should be) for the finishing work. A cement cannot set properly if the water necessary for its solidification is strained from it before the chemical action with the water is complete.

In summer time I would further recommend that, two days after the coating has been applied, the finished wall should be again wetted with a syringe or watering pot—an operation requiring a few moments only—but greatly assisting the due action of the cement.

Mr. Henry Baker, Fellow, said he believed that Scott's Cement had been used at the houses in Tottenham Court Road, which fell down a short time since, where the cement used was certainly very bad indeed. The builder had shown him the invoice, in which it appeared as Scott's Cement.

Mr. Digby Wyatt, H.S., said that he had lately met the Commanding Engineer Officer at Chatham, who had spoken in high terms of Scott's Cement.

Mr. Baker said that, if cheapness was the characteristic of the cement, the builders of the metropolis would of course avail themselves of it.

Captain Scott, Visitor, believed that some mistake had been made with regard to the houses in Tottenham Court Road, where he had heard since the accident that Roman cement had been used in the parts which failed. His own cement had also been used in the building, but whether properly mixed he was not then prepared to state. All cements were exposed to the risk of failure from improper or unskilful treatment by the workmen. But his cement had been tried at Chatham with great care by Captain Schaw. The results of the experiments would be published, but he might perhaps be permitted to read a few extracts from them.

Captain Scott then read a

STATEMENT OF COMPARATIVE COHESIVENESS OF VARIOUS CEMENTS AND MORTARS AFTER ELEVEN DAYS.

	lbs. per square inch.
Scott's, with 3 of sand (mean of four experiments)	41.15
Pasley's, pure	33.4
Francis', pure	30.2
Scott's, with 6 of sand (mean of five experiments)	29.9
Pasley's, with 1 of sand	22.7
Francis', with 1 of sand	21.5
Portland, with 6 of sand	18.28
Blue Lias, with 2 of sand	12.34
Halling Lime, with 3 of sand	8.27
Chalk Lime, with 3 of sand	7.0
Ditto, after thirty years	8.25
Mean of six experiments	2.47
Cohesive strength of Bath stone	35.2
Ditto of Inferior Bricks	27.6

At the same time it must be allowed that Scott's Cement is far inferior to Portland Cement, when used either pure or with a small proportion of sand.

The strength of Scott's Cement and of the Portland (supplied by Messrs. White and Son) was determined by Captain Schaw, R.E. and Ensign Monscreiff, H.E.I.C.E.; the other results (being the highest given) are taken from Pasley's Works on Limes and Cements.

The price of Scott's, with 6 of sand, for 6 yards of mortar, is	40s. 6d.
„ Halling Lime, with 3 of sand	46s.

To return to the accident in Tottenham Court Road. Of course, when the houses fell down it was somebody's fault; and, as soon as one of the men found out that cheap cement was used, the fault was laid to the cement. He had taken his cement to Mr. Faraday, who had advised him to take out a patent. It could be applied as cheaply as common mortar, and it was harder than anything else that could be used.

In answer to an enquiry, how the breaking test had been applied, **Captain Scott** explained that Captain Schaw had placed the bricks endways together by their smallest surfaces, whereas General Pasley had put them together by their largest; consequently, the portion of the joint (as compared with the total surface) exposed to the atmosphere was much increased in Capt. Schaw's experiments, and the results were favourably stated as compared with those of Gen. Pasley. The bricks, when cemented together, were broken down by weights applied in a scale.

Mr. G. B. **Williams**, Fellow, mentioned an instance in which he had found Scott's Cement used, and at first he did not consider it better than common mortar, and had therefore stopped the work. He found, however, too much sand had been mixed with the cement. Having altered the proportions, he became convinced that the cement was very good, and he allowed it to be used.

Mr. W. W. **Pocock**, Fellow, said, that unless a large quantity of water was used, both mortar and cement would soon turn to powder. He had therefore encouraged the use of sand which had some mud or dirt in it, for the sake of the water; and he found much good to result from that course, because it furthered the chemical action of setting. The falling of the Brunswick Theatre was attributed to the mortar—but he had a specimen of that mortar—and, on trying it recently, he found it was as hard as Portland stone—the chemical action having now had full time to take place.

Mr. C. H. **Smith**, Hon. Mem., said all cements were no doubt good as they came from the inventors, but when put into the hands of mere labourers, they had to encounter many prejudices, besides the difficulty of the workmen not being accustomed to them. It appeared to him that Captain Scott's Cement was a very excellent material, but if put into the hands of a common workman it would be very likely to fail. Such had been the case when Parker's—the so-called Roman Cement—was first introduced, many years ago.

Captain Scott said that his cement had been applied by a rough country labourer to 11 cottages near Maidstone, at 4½d. per yard, where the expense of ordinary plaster would have been 5d.

Further discussion on the subject was postponed, in order to proceed with the other business of the evening.*

The following letters have been received since this discussion took place.

Brompton Barracks, Chatham,
June 20th, 1857.

Gentlemen,

As you are aware, Mr. Baker condemned my Cement in strong terms at your meeting on Monday evening last; and, as I had not at that time seen the work in Tottenham Court Road to which he alluded, I could only reply by referring to different results elsewhere, and to the frequency with which cements, though excellent on leaving the hands of the manufacturer, are ruined by the improper treatment they receive from the builder.

Great was my surprise, however, on visiting the scene of the late accident, to find that all the walls executed in my cement, which are still standing, afford that refutation of Mr. Baker's statement of its worthlessness, which, at the meeting, I was unable to give.

I therefore called on Mr. Baker the following day, and begged him to accompany me to the spot—a request which he at once acceded to.

The result of the visit is the enclosed note, which I hope it may be in your power to append, together with this, to your notices of the meeting.

I should mention that, though I had not ventured to recommend more than three or four parts of sand, the builder (as he allows), in this instance, used six; and yet the cement is so strong, that Mr. Baker thinks (if I understood him rightly), from what he then saw in many parts of the building, that this quantity is no more than it could carry advantageously for ordinary brickwork.

I am, Gentlemen,
Your most obedient Servant,
HENRY SCOTT, Capt. R.E.

The Honorary Secretaries of the
Institute of British Architects.

11, Upper Gower Street, W.C.,
June 19th, 1857.

Dear Sir,

I have received, with thanks, the specimen of your Cement, and have perused the papers accompanying it.

I shall very soon give myself opportunities of trying its merits as concrete, mortar, and plastering, but shall take care to put the work into the hands of a respectable builder. When I spoke of it the other night at our Institute, I very incautiously adopted the error of Mr. Marsh Nelson, who, in his absurd report in re Tottenham Court Road, condemned the cement itself and the manufacturers of it, instead of the builder, who, for his own petty gain, both mixed and used it improperly, and quite spoiled an article which I now verily believe to be a good one.

I am, Dear Sir,
Yours faithfully,
(Signed) HENRY BAKER,
M.I.B.A.

Capt. Scott, R.E.

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* Specimens of Ferrey's Incised Stucco, made of Scott's Patent Cement, manufactured by Lee & Co., may be seen at the Rooms of the Institute, 16, Grosvenor Street.

SOME DESCRIPTION OF THE MECHANICAL SCAFFOLDING USED AT THE NEW PALACE AT WESTMINSTER, PARTICULARLY IN REFERENCE TO THE THREE MAIN TOWERS OF THE BUILDING,

By Charles Barry, Jun., Fellow.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, June 15th, 1857.

It will probably have often been the case with architects engaged on extensive and difficult works or buildings of peculiar construction and purpose, to have to consider and devise particular arrangements in the shape of scaffolding, either with the hope of effecting some economy by diminishing labour, or to meet some emergencies attendant on the works themselves. When this has happened, it must have been a matter of very great interest to enquire how like difficulties had been met by others, and to examine the records of their trials for similar objects, and the results. But here much difficulty usually presents itself from the paucity of such records, which, unless under some unusual circumstances, are very seldom to be found. The reason is obvious. The main object proposed to himself by an architect is, the perfect realization of his conception in the building, and though as each successive stage or process necessary comes under his attention, it is considered very carefully with reference to its bearing on the whole work, yet when that is completed, the processes by which it has been effected—the tools used upon it, as I may say, are forgotten in the results. The scaffolding is cleared away with jealous care, as though to *prevent* any record of it remaining, while the structure stands to attest its claims to admiration for truth or beauty in future times. It will readily occur to all how these remarks apply to many of the great works of past ages—the pyramids—the temples and obelisks of Egypt—the massive walls of Jerusalem—the wonderful constructions at Baalbec—and in our own country, Stonehenge and other Druidical remains; all of which have excited universal interest and wonder, the huge masses of which they are composed having evidently required the exercise of no ordinary mechanical skill, and consequently many have been and are the ingenious theories explaining how they could have been carried out. Again, we should all be gratified by being informed how the Mediæval architects erected the marvellously lofty and delicate spires of Antwerp and Strasburg, in which it must evidently have been one part of the problem, that the scaffolding should be self-supporting and independent of the delicate work itself. It has therefore occurred to me that some interest might be attached to a short description of the various mechanical contrivances in the way of scaffolding, which have been employed in the execution of the works at the New Palace at Westminster. I have been also induced to draw up such a description by the hope that other Members of this Institute may contribute similar memoranda from their own experience to our general stock of interesting and useful information on *constructional* subjects. In this instance, moreover, I am prompted by feelings of affection and respect for my father, the architect of one of the mightiest edifices in Europe, who never can be induced to describe his own works, and by the desire that some record of them may nevertheless remain. To make good any omissions or deficiencies in my account, or in my own recollections of what has been effected, I am favoured by the attendance here this evening of my friends Mr. Meeson and Mr. Quarm. The former having been long my father's chief assistant in his office, and the latter having occupied a similar office of trust for many years as chief superintendent at the building, they have both been materially concerned in devising and carrying into effect the several bold and daring constructional contrivances which have been adopted, and which it will be my endeavor to explain.

The extent of the New Palace at Westminster—the necessity for its being carried out in portions—and the exigencies arising from constructing the new works, in many cases, where the old buildings they were to replace remained in daily use, led to curious contrivances of all sorts. But in attempting to recall them, I have met with the difficulties already alluded to, for few and but scanty records exist even at the present time. Although much anxious thought and contrivance have been required, the result has perhaps been a mere pencil drawing, or a verbal direction, illustrated at the moment with a piece of chalk on the nearest wall. And therefore, although from having been myself engaged for some years daily at the building I have a perfect recollection that several curious contrivances were devised, I have found it quite impossible to describe them intelligibly by diagrams. I must therefore rest contented with briefly alluding to some of them, and invite the attention of the meeting to a more detailed account of the scaffolding and hoisting machinery employed at the three main towers, of which more records do exist, and which I believe are quite peculiar in principle to this building.

In the year 1840, when the commencement of the superstructure was made with the river front, (the coffer dam and terrace wall having been completed) I may observe that, although the old fashioned kind of scaffolding of poles and ropes had in some instances been superseded by the so-called whole timber or framed scaffold, with its tram-way and crab engines aloft, yet the latter was uncommon, and had never been applied on an extensive scale, and its peculiar advantages and economy had consequently never been much tested. I believe I am correct in saying that the first, or one of the very first instances, of the use of whole timber and tram-way scaffold was by my father at the New Grammar School at Birmingham, in 1833. The elaborately decorative character of the face masonry at the New Palace made it necessary either to execute the finishing in situ, which is still nearly always the method abroad, or to employ a system of scaffolding, by means of which heavy worked blocks might be raised without any chance of injury, and adjusted in their places with the same precision and facility as a brick could be laid by hand. I will illustrate my meaning by remarking that in very many cases the stone to be raised weighed 4 or 5 tons, and had on its face carving or other work—the result of three months' labour in the workshop. It had therefore become a valuable work, worth careful handling, though of course had the face-work been done after the stone was fixed in the rough, much longer labour by far would have been necessary.

The principle of framed scaffolding in connection with tramways, either on it, under it, or both combined (on which the trucks with stone and the hoisting engines travelled), adopted in the River Front, was found so advantageous that in one form or another the same means have been used to meet all the subsequent requirements of more special portions of the work. For instance, when it was required to execute the internal decorative masonry of the lobby of the House of Commons, a scheme was devised by which one small traveller was made to act on all the four sides, by an ingenious arrangement for turning round the square corner at each angle, either with or without its load: so that a stone might be at once lifted from the banker on which it had been worked, and carried round suspended to be set in its proper place.

Again, when the internal masonry of the central octagonal hall was in hand, a circular single line of rails was laid down, just inside but clear of the walls, on which a pair of lofty framed legs like tressel shear legs travelled, connected with a centre pole, as a pivot, by means of a strongly braced and trussed timber frame at the top, on which again rails were fixed to receive the wheels of the travelling engine. (Diagram No. 2 at G G.) This framing and railway projected so far over, that the tracery heads of the large windows, the courses forming niches, and the springers of the vault could all be worked below with the utmost exactness, and dropped into their places with such certainty of the mouldings fitting, that the subsequent labour of cleaning off was always trifling, and often unnecessary.

I could wish that it were possible to exhibit also the centering of the large octogonal stone vaulting over the central hall, 55 feet in diameter. I well remember that it contained several novel and peculiar arrangements; one of which, I think, was, that all the stones for the vault were raised through an orifice in the exact centre of the centering itself, but I have been unable to find any drawing or details relating to it.

I will now invite attention to the means employed to raise and set the masonry and brickwork of the three great towers of the building, which differ very materally in their form and character, and therefore in their construction, commencing with the Central Tower, which was the first completed. I have already described generally the means used to build it up to the vaulting over the Central Hall. It will be seen that the central lantern is supported upon a cone starting from the springing of the vaulting; a powerful chain bond is here introduced, by means of which the resolution of the entire weight of the stone lantern on to the base of this cone is effected, which of course adds to the security of the groining itself. The cone, which was constructed of brickwork and afterwards cased with the stone tabling, was itself a work of some difficulty. The arrangements of the elaborate system of ventilation introduced into the building by Dr. Reid, which had reference to the central tower as the point of ultimate extraction of all the smoke and vitiated air, required that very large orifices of communication with the surrounding roofs should be maintained through the base of the lantern, as well as into the lantern itself. It was therefore necessary to perforate the brick cone by large arched openings; the consequence was that the portions between them had to be built isolated from each other up to the spring of these openings, and were therefore obviously overhanging walls. As a second system of centering would have been very expensive, it was determined to attempt to build the cone by means of a trammel, only working round a centre pivot in such a manner that the inner surface or interior should be kept true all round. Ties or chain bond of iron were introduced at the points shown, to prevent all chance of the work afterwards spreading outwards at the foot when subjected to pressure; and the whole was successfully and rapidly accomplished. The leaning portions, which looked very insecure to the unpractised eye, were duly connected by arches turned through the whole thickness of the wall, and connected with iron struts, as shown; the system of the trammel answered perfectly, and the brick cone or base for the stone lantern was completed (without the accidents confidently predicted by many) and, perfectly true in form and plan, was ready to receive the further works about the latter end of 1841.

I would here call attention to the diagram, (No. 1,) to point out that the cone was really rendered continuous on plan during its whole progress by means of temporary timber struts, introduced in the openings, which, in point of fact, acted as keys or horizontal voussoirs; without these there would have been, of course, risk of the disconnected portions falling. These struts were left in till some time after the arches were turned over the openings, and the work had had time to set thoroughly; when they were removed, a minute examination could not detect a trace of movement or flaw in any part of the work, nor is there any now under the load of the tower above it. The brickwork was executed in mortar, with occasional tiers of four or five courses in cement, within seven weeks from the commencement.

Up to this time all the materials had been raised internally through the central orifice in the stone groining; but it now became necessary to alter this mode of proceeding, inasmuch as the finishings of the central hall, with other portions of the works adjacent, were required to be given up to render this part of the building available for public use. On the block plan of the building, the small court, called the Peer's inner court, will be seen. From this henceforth all materials were hoisted outside up to the level of the platform coinciding with the upper rim of the cone, and deposited on trucks running on a tramway extending over the roofs of the building to the centre of the platform over the cone: from this point upwards the lantern of the central tower was built by the system of framed scaffolding shown on the diagram. (No. 2.) This scaffold was put up and added to from time to time as the work proceeded,—first up to the point A on the top of the second tabling, then to B, C, D. Platforms were constructed at these various levels to receive the materials hoisted, as well as for the use of the masons; and the stone, being always raised in the centre through a shaft or ring left in the framing and platforms, was easily set by the workmen, without depending in the least degree on any part of the work already built: this was obviously a point of the utmost importance, arising from the delicate mullion work of the lantern windows. The raising of the materials from the ground to the lower platform or tramway was effected by connecting the small engine E with a drum and tackling immediately over the court below: the materials, having arrived at this height, were taken by trucks to the centre of the tower, when the same engine was connected with another set of tackling running over a pulley in a frame fixed about six feet higher than the next intended platform. Large stones were thus raised by two lifts from the ground to their final position, 150 to 200 feet or more, without handling in any way, and consequently without risk of injury. This arrangement was continued by simply shifting the pulley higher and higher, and lengthening the connecting gear between it and the engine drum, until the internal diameter of the spire became too small to receive it, when the platform was so framed as to extend outwards through the small lucarne lights in the base of the spire sufficiently to allow a scaffold of ordinary poles to be erected on it. All the remainder of the materials, including the metal terminal, was raised, as described, to this platform in the interior, and then run out through a temporary opening left for the purpose in the base of the spire itself. The same principle of keeping the scaffold clear of the work was continued; no putlogs whatever were used, but by disposing horizontal poles diagonally on plan, the whole was firmly braced from time to time. The engine used was a portable one, known as "Gough's patent," and its cost was under £100.; the scaffold cost about £500. more. I will hereafter give some interesting data respecting the economy which can be effected by the use of steam-engines for raising materials for towers and like structures, but before quitting the Central Tower, I may mention that its dimensions are as follows:—

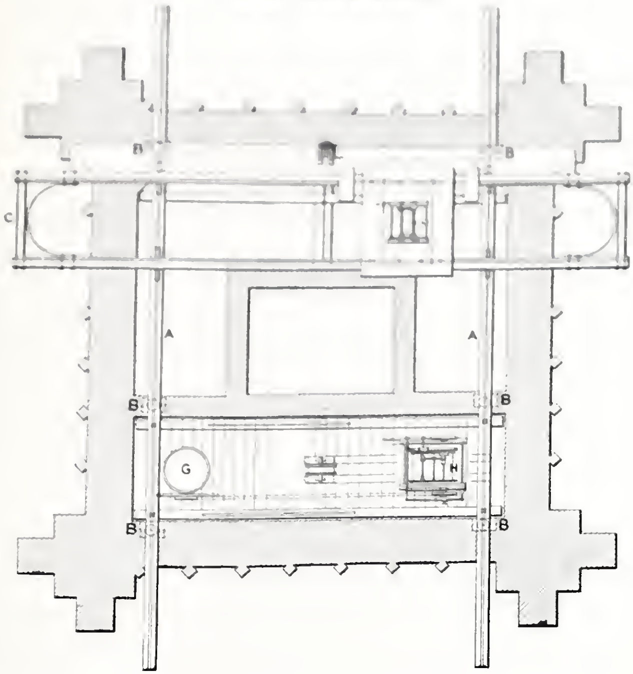
External diameter	70 ft.
Internal diameter of the octagon hall . . .	55 „
Diameter at the base of the lantern . . .	33 „
„ „ spire	11 „
Entire height from the basement level to the top of the spire .	266 „
Height of the octagon hall from its pavement to the vaulting .	59 „
The approximate number of cube feet of worked masonry above the cone, exclusive of brickwork . . .	25,000 „

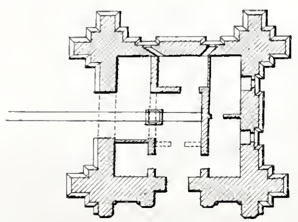
We now come to the Clock Tower, and I have in the outset to remark, that the principal peculiarity of the scaffolding used in this and in the Victoria Tower is, that it rose with the building; being, if I may so express it, self-raising and self-adjusting. The other great peculiarity of all the tower scaffolds consisted in the employment of steam power to hoist, the steam-engine being placed at the top, and close to its work, instead of at the bottom, where it would generally be fixed. In the erection of the Clock Tower the stone and other materials were raised *inside* from the ground to the summit, so that, there being no appearance externally of a scaffold or other contrivances, the tower seemed to grow, as it were, by some inherent vital power. From the plan it will be seen that there is in the interior a shaft, intended to be eventually occupied by the staircase and a lift-machine: advantage was taken of this shaft to raise all the materials by the machinery illustrated by the diagrams Nos. 5, 6 and 7.

Main bearing beams A A, framed of whole timbers 2 feet 3 inches deep, and 14 inches wide, bolted and strengthened, were stretched across the tower walls from east to west, and on them rails were laid turned up at each extremity. These bearers had points of support on six blocks of cast iron with screws B B, which could be raised at will, as hereafter described. A secondary frame of timber or traveller C C moved on the rails just mentioned from east to west, and on this second frame other rails were laid, on which the small travelling crab or jenny, used to set the stone, &c., moved. Means were provided to enable the man in charge of the crab to move it and himself along, with or without a load, by turning a windlass at D, having a bevel wheel in connection with the axles of the traveller, and similar means at D^1 enabled him to move also the main traveller C C, mentioned above. Thus every facility was provided for the worked stone being moved to any part of the tower walls *in suspension*, and without handling. A further contrivance was necessary, however, to raise it from the ground. To effect this, two strong queen trusses, the length of the shaft or chamber above alluded to, and separated as much as its width would allow, were *suspended* to the main bearers A A by means of wrought iron bolts $1\frac{3}{4}$ inch in diameter, passing through the uprights and sill pieces of the trusses, and through broad cast iron plates E E under the sills: 4-inch planking was then laid on the same sill pieces, having in it an aperture sufficiently large to allow the stone, &c., raised to pass through. Immediately over this aperture, and resting on the head of the trusses, was the pully F over which the chain tackling used passed to the ground. A portable steam-engine G, Gough's patent, of $2\frac{1}{2}$ horse power, was fixed on this platform at one extremity, with a driving band from its fly-wheel to a large drum H, about 3 ft. 6 ins. in diameter, at the other side of the platform, and round this drum the chain was coiled and uncoiled. From this description it will be readily seen that worked stone, bricks, sand, water, iron, &c. &c., were raised from the ground up to, and through the aperture in the platform. In the case of a block of stone, a small travelling truck K, in diagram No. 7, moving on rails laid on each side of the aperture, was run under the block, which would be deposited on it to allow the chain to be free for another descent; meanwhile the crab first described, having been brought over the block by means of the arrangements already detailed, would lift it and deposit it on the bed prepared for it on the tower walls. The small truck K would be run back to allow another stone to be raised through the aperture in the engine platform as before, and the setting would proceed with such rapidity that, to keep one setter at constant work at the top, forty men were constantly preparing stone at the bottom. It has been found in practice that, with an ordinary framed scaffold and traveller one man will require twenty-five masons preparing stone to keep him supplied, while, as just stated, by the use of the steam-engine, one man required forty to prepare stone for him. What would be the proportion when the old system of poles and ropes is used I have not ascertained, but it would probably prove as far behind the framed scaffold, with the traveller worked by hand, as that is behind the powers of a scaffold where steam power is made use of. It only remains to point out the very simple means of raising the whole of this platform, with its engine, crab, travelling tramways, &c., the weight of which altogether, without any materials upon it, was about sixteen tons.

It will be observed that the main bearers A A were long enough to bear from wall to wall. At the six points B B ordinary jack screws were placed, with solid large blocks of iron at the top and bottom of each, through the latter of which the screw could pass. A nut or collar worked on the screw, having sockets to receive the ends of the iron bars used to screw it up or down, which were used in the same way as capstan bars. Now, supposing the main bearers to be resting on the walls, as shown, the jack-screws, having their nuts screwed hard up to their heads, would be put in their places, the walls under those bearings being built up to their under sides. All six screws would then be worked simultaneously, and the whole arrangement, platform, engine and all, would be raised up at

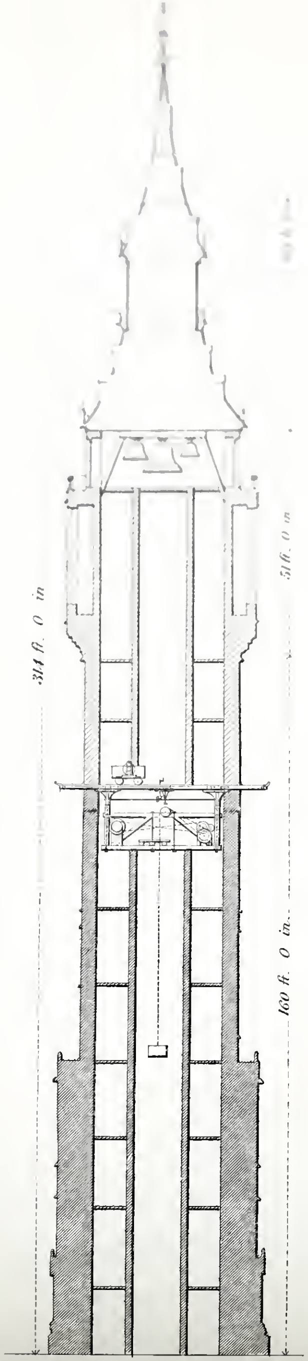
PLAN OF THE CLOCK TOWER
TO A LARGE SCALE





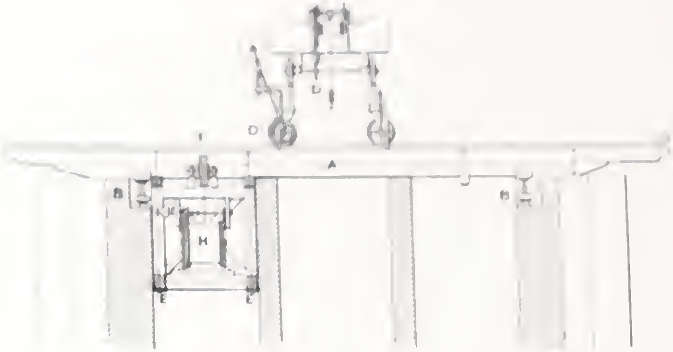
GROUND PLAN

Nº 4.



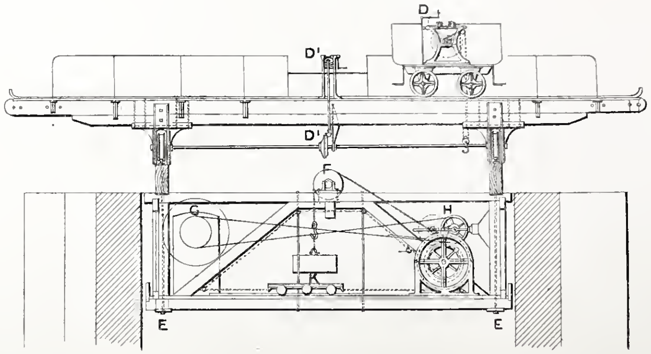
SECTION THRO' CLOCK TOWER.
Nº 5.

SECTION THRO CLOCK TOWER
TO A LARGE SCALE



Nº 6.

SECTION THRO' CLOCK TOWER.



Nº 7.

CLOCK TOWER.

Day & Son, Lithrs. to the Queen.

once about 3½ feet, that being the length of the screws. The travellers being then three feet clear of the tower, three feet more of the work all round could be set, and then a fresh lift would take place; though it is obvious that by blocking up the main bearers from the walls, two or more lifts of three feet each could take place before setting the masonry was resumed, when such a course was found in some cases to be more convenient. In this way the whole of the stone work of the Clock Tower was raised and set, and when that was finished, the same power raised the iron frame work, beams, and plates, of which the upper part and roofing is formed; but to fix which the simple scaffold of poles and ropes, cleverly braced, which still exists, was used.

The cost of the scaffold, with the engine and machinery, may be roughly stated at about £700. It raised about 30,000 cubic feet of stone, about 300 rods of brick-work, besides many tons of iron and other matters. It did all this so quickly and continuously, that there was no excuse for the workmen, either below or above, wasting time; while its manifest economy and precision of working need no further illustration. The dimensions of the Clock Tower are as follows:—

External dimensions on plan, average for the whole height . .	40 feet square.
Height to the cornice below the clock	160 „
Height thence to the top of the stonework	51 „
Height of the metal roof containing the bell chamber . .	103 „
Total height .	314 feet.

Before quitting the Clock Tower I may advert to the extraordinary reports a short time ago circulated, that it would be necessary to raise the great bell from the outside by means of a special scaffolding, at the cost of several thousand pounds, only to say that of course the subject had not been overlooked, as was charitably suggested, but that arrangements had been made from the commencement to enable a bell as large as was considered appropriate to be raised up the central shaft in the tower, and that at this moment all the appliances of tackling, crab, engine, &c., are prepared and waiting for the proper time to arrive, when there is no doubt that the bell will be raised with certainty to its permanent position in a single day.

VICTORIA TOWER.

At the Victoria Tower much the same principle of arrangement, as far as regards the position of the steam-engine and the rising frame work of the whole, was made use of, though the much larger dimensions of the structure caused some important differences. The internal diameter of the tower is 51 feet, and over to over of the turrets, 70 feet. In the first place, a strong trussed frame, over the whole area of the tower on plan, had to be constructed to carry all the machinery, and sufficiently stiff to bear being raised at once by the screw power without any racking or straining, and consequent disturbance in the position of the apparatus upon it. (See diagrams Nos. 8 and 9.) This framing consisted of single balks of timber, 51 feet long, and 14 inches square (very unusual specimens of timber); these beams or sole pieces AAAA crossed the area as shown, while similar pieces were placed all round close to the inside surface of the walls; diagonal braces at each corner Z Z tied all together on plan, and the four beams crossing the centre of the tower were strongly trussed, both above and below, the latter being necessary to resist the upward strain on the centre should all three travellers be possibly loaded at the same time. That the whole arrangement was thus rendered perfectly rigid and stiff, the experience of constant use for nine years has abundantly proved. A circular cast iron rail was next laid on the framed platform, while part of the framing was covered with 2½ inch planking, and defended by a hand-rail for the safety of workmen, and on this at C the portable engine of six-horse power was placed, with its drum at D connected by gear work with the driving wheel of the engine. As the lower part of the Victoria Tower, which contains the royal entrance, is groined over with stone at the height of about 63 feet from the ground, the materials for building the upper part could not be raised inside, as at the Clock Tower, and the mode adopted, as shown in the diagram, was the result. An under trussed parallel framing or traveller was formed, moving round a hollow pivot in the centre of the tower E, and extending over and clear of the walls. The king posts of the under trusses were in fact framed tressels, or coupled shear legs, bolted together and strengthened so as to be perfectly rigid as if in one piece; each leg of these tressels had grooved wheels at the foot, which ran on the circular iron rail on the main platform first described, thus enabling the whole to radiate round the centre.

A pulley wheel, 4 feet in diameter, was attached to the framing at F clear of the outside of the tower walls, and a similar one was fixed over the orifice in the hollow centre pivot above referred to: over both of these the chain from the engine drum worked, and raised stone, bricks, sand, &c., from the ground, which were then deposited either on the walls or on the planked platform in the angles, and the chain was set free for another descent. There was also a contrivance, indicated in the diagram, to connect the hoisting traveller, when required, with the engine drum, and to move it and its load round on the circular tram rail to any spot on the top of the tower that might be most convenient for deposit at the moment.

To set the stone so raised, there were two other radiating framings or travellers G G formed in like manner, and also moving round the centre by wheels running on the circular tram-rail on the main framing. These travellers were of such a length as to extend to the outside of the angle turrets, and they could each command one half the area of the tower, working at the same time with the setter to each. On their upper beams rails were placed, on which the crab engine passed to and fro. It will be evident that by this arrangement every portion of the tower walls could be reached, and the stone raised by the hoisting machinery set down in the place prepared for it with the greatest nicety. To raise this huge platform, with its engine, radiating travellers, &c., weighing nearly forty tons, the following means were adopted, which proved perfectly successful to the end of the works. At the points H H H H, guide and bearing timbers were placed vertically, coupled together with bolt holes at intervals. These were scarfed and braced together, in heights of 12 feet, as required, and screws very carefully made, 3½ inches in diameter and 6 feet long, with solid head pieces to fit under and grip the timbers of the main platform, were placed between each pair of these guide posts. By means of a bevel pinion wheel with a winch handle K, working through a nut at their lower extremity, the large screws could be raised or lowered with ease and certainty, and with them the main platform, the ends of whose timbers rested, as will be seen, on the screw heads. This operation was carried on by lifts of 6 feet each, a man being placed at each screw on the platform M, (which being attached to the nut of the screw, rose as it rose,) and all turning simultaneously the whole mass was raised step by step, as required, up to and above the top of the tower parapet. It should be mentioned, that to provide against any serious accident, from disarrangement of the lifting screws for instance, slots or chases, 14 inches wide and 9 inches deep, were left in the walls of the tower at the ends of each of the main beams; these were carefully built up in cement as the scaffolding rose, so that the only time any fall could occur would be during the act of screwing up, when of course there would be no materials on the platform to add to the weight, and any such fall, had it occurred, would have been too limited to cause any injury.

No such accident, however, occurred, nor indeed has any happened to derange the machinery during the whole time that it has been in use.

The Victoria Tower scaffold has often had materials on it weighing 40 tons, which added to its own weight make 80 tons. The Clock Tower scaffold has frequently had to carry 30 tons of materials.

One very severe trial was experienced when the former tower was raised to the height of nearly 200 feet. The workmen, on leaving work, had omitted their usual custom of lashing one of the radiating travellers, to prevent the wind by any chance moving them. A hurricane arose during the night and lasted the following day, and a violent gust acting upon the radiating arms moved them round on the circular rail, and blew them together with terrific violence, as may be supposed, when it is mentioned that they were 50 feet in length. The report of the blow was heard at a great distance, and those engaged on the work fully anticipated that the framing must have been shattered; but when they ventured up to examine, as soon as the wind abated, it was most satisfactory to find that no trace of damage was to be seen, the whole arrangement having proved amply stiff and strong to resist the concussion.

Some calculations as to the cost of labour—the coals for the engine—repairs, &c. to the machinery may be interesting. They refer to the Victoria Tower and were the result of observations on a portion of it 60 feet in height.

In this portion there are about 18,800 cube feet of worked stone set, and about 57 rods of brickwork. Assuming the relative cost of the labour on the stone to be two-thirds of the whole, and that on the brickwork one-third, which supposition is probably nearly correct, it was found that wages and repairs cost, in all, £572. for the period during which the engine worked—equal to forty weeks—and taking two-thirds of this amount, or £496. as applicable to the stone, gives a cost of 6½d. per foot cube, and one-third as applicable to the brickwork, or £76., a cost per rod of 27s.

This amount does not of course include the first cost of the engine, which has sufficed, not for a height of 60 feet only, but for nearly the whole tower.* And when I state that the cost of this engine and tackling, with the hoisting apparatus, &c. was only about £1,800., and that there are about 117,000 cube feet of stone, 1,350 rods of brickwork, and 1,190 tons of iron in the tower, it will be seen that it is of no moment at all so long as its use materially diminishes the time of labour of the workmen.

The engine required the services of an engineer and an assistant; it was generally worked half a day or 5 hours, and consumed in that time about 3 cwt. of coal. It was calculated to raise 4 tons.

The time a stone (the weight immaterial) was in transit from the ground to the top of the tower, when 250 feet high, was 3½ minutes, including its deposit on the platforms above and detachment from the tackling.

All delays and hindrances included, the average number of lifts actually made per hour was ten, though in some cases as many as twelve and thirteen were accomplished.

The box used to contain materials other than stone, such as bricks, mortar, lime, sand, cement, &c. was so contrived that the bottom opened in two halves on releasing a lever handle at the side, so that the contents were at once deposited where required without the delay of emptying by hand.

The foregoing arrangements were continued with complete success in the erection of the Victoria Tower until a height of about 6 feet above the parapet was reached, which was as high as it was considered desirable to raise the engine and platforms. The pinnacles, 85 feet high from the cornice, were constructed by means of a cradling scaffold. The hoisting traveller remained as before, raising all the materials and depositing them on the platform at AA. The setting travellers were shortened so as to move round their pivot *within* the pinnacles, and they were then able to set all the stone work of the parapet between the pinnacles; and they still remain to assist in moving the iron work, &c. that is yet required for the roof.

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* The Steam engine was not used for the first 85 feet from the ground both of the Victoria and the Clock Towers.

The cradle scaffold for the pinnacles deserves some attention, being very daring in its construction, since it is entirely detached from and independent of the mason's work.

Its whole support is derived from a framed skeleton platform at AA, the timbers of which pass through the apertures in the eight sides of the pinnacles. (Diagram No. 10.) They are carefully bolted together and upheld at each angle by raking struts bearing upon the weathering of the string cornice of the tower. On this framework the braced scaffold was raised, being added to as required up to BB, with horizontal ties at each stage. The plan of the upper one B B shows the mode in which these horizontal courses were braced so as to leave the centre perfectly free for the pinnacle to rise within it.

Up to B B all the stone was raised *within* the pinnacle itself, being run into it on trucks at the level A A, and raised by tackling passing over a pulley at the top of the scaffold and connected with a crab engine at the base. Above the level B B, however, the pinnacle gathered in, and the stone was consequently raised outside from the platform A A by an ordinary tackle and fall; from this point upwards the scaffold is continued high above the cap stone of the turrets in order eventually to fix the crowns, with the exception of which and of the roof, the shell of the entire tower is now completed. This upper part of the pinnacle scaffold is formed with ordinary poles and ropes, but still keeping intact the principle that it is self-supporting and in no way resting on or touching the work. The scaffold poles look indeed little larger than wires from below; but this is hardly a matter for wonder when it is remembered that from the base of the tower to the top of the vanes is no less than 325 feet.

In concluding these memoranda, which I feel sensible are crude and imperfect, I can only hope that I may have directed the attention of my hearers to a subject which I am confident must be considered of interest to all architects, and very important to those who may be engaged in works of a more than ordinarily extensive and arduous kind.

I think they may also help to prove that architects are equal, when called upon, to devise and carry out works of construction requiring *originality and daring* as successfully as the members of the kindred profession of engineers. And I trust you will agree with me that I am justified in so characterising the works I have been describing.

In answer to questions from Mr. Digby Wyatt, Hon. Sec., Mr. Barry said that the builders had refused to undertake any responsibilty with regard to the tower scaffolding; and that therefore it was a matter of necessity that the architect should take that responsibility upon himself. The means of raising the materials as well as the scaffolding and machinery were provided by the Government; but this circumstance was taken into consideration in determining the contract scale of prices for the works. The architect was not paid extra for designing the scaffolding. He found himself expected to render that service as part of the work to which his fixed commission was applicable, although the builders would not have undertaken at the ordinary contract prices the handling and moving so much elaborately carved stone work, at the unusual altitudes required, without arrangements were provided them for hoisting and raising the materials, and to meet this requirement the scaffolding above described was designed and executed by the architect.

In answer to another enquiry as to the successive resting places of the main upright guide posts supporting the raising screws under the platform of the Victoria Tower,

Mr. Meeson, Visitor, referred to the drawings, and gave some further information as to the mode of raising the scaffolding from stage to stage, as facilities were presented by offsets in the walls or by the iron bearers supporting the various floors in the tower—the numerous stories in which, would be occupied as depositories of parliamentary records.

Mr. Digby Wyatt further asked, whether there were any means provided to insure the stability of the travellers. They appeared to him to be very narrow in proportion to their length; so that, some means would be required to steady them in the event of a strong wind acting on them.

Mr. Meeson explained the peculiar construction of these machines, and the precautions adopted to prevent any difficulty arising from that cause.

Mr. Digby Wyatt said the importance of Mr. Barry's communication must be apparent, and they must all feel very much indebted to him for the interesting information he had given; which, indeed, must make them the more regret that Sir Charles Barry should have allowed some of the valuable details to escape record altogether. They could all understand how interesting it would be to have similar accounts of the contrivances adopted in erecting the great monuments of antiquity. They well knew the old crane at the top of Cologne Cathedral, by which the materials for that structure had been raised, upon a principle similar to that adopted by Sir Charles Barry. But with regard to Strasbourg and some other cathedrals, whatever mode was used, raising the materials, without straining the work, must have been a matter of great difficulty.

Mr. Donaldson, H.S.F.C., expressed a hope that copies of the interesting details and drawings which Mr. Barry had brought before the Institute, would accompany the printed paper which would be sent to the Members.* He fully concurred in admiring the ingenuity of Sir Charles Barry's mechanical contrivances. The ascent of the Victoria Tower could be accomplished with the greatest facility, and he had very lately gone up with Sir Charles Barry, who had explained the construction of it to him. He hoped that Mr. Barry would give the Institute, at some future time, an explanation of the scientific construction of that Tower, and especially of the iron-work supporting the floors of the record rooms, and the lofty roof. Intended as that tower was for the future storehouse of the Records of Parliament, it would be a useful lesson to the members of the Institute, whether young or old, to have the numerous ingenious details of its construction recorded; and he hoped that, during the recess, Mr. Barry would be able to prepare a continuation of his most able, ingenious, and interesting paper.

Mr. Barry said he could hardly then promise to do so, as the attempt must necessarily require much time and involve great labour. The Institute, however, would be glad to know that he had induced his friend, Mr. Meeson, if called upon next Session, to give a description of the very peculiar iron beam construction adopted in the Palace at Westminster.

Mr. Digby Wyatt added, that Mr. Edward Barry had also promised to give a more general description of the building.

The cordial thanks of the Meeting were then given, with much applause, to Mr. Charles Barry.

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* The lithographic illustrations which accompany this paper were copied on a reduced scale, by means of photography, from Mr. Barry's original drawings.

APPENDIX.

PENNETHORNE TESTIMONIAL.

NARRATIVE OF THE PROCEEDINGS

CONNECTED WITH THE PRESENTATION

OF

A GOLD MEDAL

TO

JAMES PENNETHORNE, ESQ. ARCHITECT, F.I.B.A.

Architect and Surveyor of H. M. Parks, Palaces and Public Buildings,

BY HIS PROFESSIONAL BRETHREN,

ON HIS COMPLETION OF SOMERSET HOUSE.

London, May 1857.

Mr. PENNETHORNE received in June 1856 the Address with which the following statement commences. From various accidents, that occurred during the execution of the dies of the Chambers Medal, Mr. Benjamin Wyon was not in a condition to produce a perfect impression until May, 1857, when the dies were completed, and a very fine Medal was the result of Mr. Wyon's taste and skill. As the Royal Institute of British Architects were then about to present their annual Medals, the Council of that body kindly yielded to the wishes of the promoters of this Testimonial, and allowed the presentation of the Medal to Mr. Pennethorne to take place on the same occasion, when Earl de Grey, the President, was in the chair.

TO JAMES PENNETHORNE, ESQ. M.I.B.A., ARCHITECT AND SURVEYOR OF HER MAJESTY'S PARKS, PALACES AND PUBLIC BUILDINGS.

London, 1*st July*, 1856.

Dear Sir,

Your Professional Brethren are anxious to congratulate you on the successful completion of your design for the Western Wing to Somerset House; in which, at the same time that you have adhered to the taste and style of the original edifice, and have done full justice to the genius of Chambers, you have adapted these additions to a difficult site with great propriety, and thereby produced a striking Architectural feature in the entrance to London by Waterloo Bridge.

We avail ourselves of this opportunity to express our sense of the ability, with which you have treated various other Public Buildings, which you have been called upon to erect as an officer of the Crown, and with which you have carried out the Metropolitan Improvements confided to your management.

During a long professional career many of us have had occasion to transact public business with you in your official capacity: on every occasion we have experienced from you the readiest access, as also the greatest courtesy and frankness. While every application has been met with all the facility, that your office could afford, we have had to recognise the skill and intelligence, which you have habitually brought to bear upon complicated and difficult questions of a technical nature, and the most anxious attention to protect the public interests in the very extensive purchases of property entrusted to your care.

Impressed with these feelings, we desire to offer you a mark of our cordial respect for your character as an Architect and Surveyor, and for your bearing as a Gentleman: and understanding that the "Art Union of London" have in preparation a Medal of Sir W. Chambers, with a representation of the Strand

Front of Somerset House on the reverse, we have applied to the Council of that body, and have received their consent to have an impression *struck in gold*, which, as soon as executed, we shall request you to accept, as a mark of the kindly feelings of regard borne to you personally by your Professional Brethren.

SAM$^{L.}$ ANGELL.
THO$^{S.}$ BELLAMY.
WILLIAM TITE.
SYDNEY SMIRKE, A.R.A.
CHARLES BARRY, R.A.
THO$^{S.}$ HENRY WYATT.
GEORGE POWNALL.
EDWARD I'ANSON.
CHARLES MAYHEW.
H. MAWLEY.
GEO. MAIR.
EDW$^{D.}$ C. HAKEWILL.
CHARLES BARRY, Jun.
CHARLES CHARNOCK NELSON.
WILLIAM SNOOKE.
JOHN HAMMOCK.
HENRY CLUTTON.
FRED$^{K.}$ MARRABLE.
W. J. GARDINER.
AMBROSE POYNTER.
J. H. GOOD, Jun.
JAMES HOWELL.
GEORGE SMITH.
SAMUEL BEACHCROFT.
HARRY OLIVER.
GEO. B. WILLIAMS.
SANCTON WOOD.
HENRY CLUTTON, 9, Whitehall Place.
JAMES BELL.
T. H. LEWIS.
J. J. SCOLES.
TALBOT BURY.
W. J. BOOTH.
MARTIN JOSEPH STUTELY.
J. H. GOOD, Ch. Commiss$^{r.}$
CHARLES PARKER.

ARTHUR ASHPITEL.
JOHN COLE.
PHILIP HARDWICK, R.A.
C. R. COCKERELL, R.A.
A. SALVIN.
JOHN SHAW.
JOHN HENRY HAKEWILL.
GEO. GODWIN.
OWEN JONES.
HENRY BAKER.
M. DIGBY WYATT.
ANDREW MOSELEY.
JOHN GIBSON.
JOHN DAVIES.
DEC$^{S.}$ BURTON.
H. E. KENDALL.
HENRY HARRISON.
P. C. HARDWICK.
BENJ$^{N.}$ FERREY.
W$^{M.}$ RAILTON.
HENRY GARLING.
ROBERT HESKETH.
EDWARD M. FOXHALL.
GEO. GUTCH.
CHARLES BEACHCROFT.
THO$^{S.}$ L. DONALDSON.
JAMES THO$^{S.}$ KNOWLES.
CHA$^{S.}$ FOWLER.
WILLIAM HOSKING.
WILLIAM MOSELEY.
W$^{M.}$ G. HABERSHON.
EDW$^{D.}$ HABERSHON.
FRANCIS EDWARDS.
DAVID MOCATTA.
EWAN CHRISTIAN.

The following names were forwarded after Mr. Pennethorne had received the above Testimonial.

DAVID BRANDON.
C. F. OLDFIELD.
T. ROGER SMITH.
JOHN TURNER.

At an Ordinary Meeting of the Royal Institute of British Architects, held on Monday, 18th May, 1857,

EARL DE GREY, K.G., President, in the Chair,

After the presentation of the Royal Gold Medal to Owen Jones, Esq., Fellow, and the other Medals and Prizes to the various recipients, W. Tite, Esq. M.P., Fellow, rose and addressed his Lordship to the following effect:—

Mr. Tite begged to address his Lordship, and in conjunction with his friend Mr. Cockerell, Professor of Architecture at the Royal Academy, to introduce Mr. Pennethorne to his Lordship's notice. Their object was to ask him to add the grace of his Lordship's eloquence and the honour of his position to the compliment, they desired to offer to their worthy colleague and fellow, Mr. Pennethorne. A compliment, which every one present would feel was well deserved, and which all were desirous of paying to him. There had been for a great many years in England an office of some importance, called the Surveyor-General, and this office was in effect held by their friend Mr. Pennethorne. Inigo Jones occupied that office in his day, whether by the same title he did not know, but in that capacity was engaged in rebuilding portions of Somerset House, and for doing so he received the sum of 8s. 4d. per day and £40. for house rent and the use of a clerk. (Loud laughter). Now, he hoped their friend Mr. Pennethorne had been better paid. (Renewed laughter). The portion of Somerset House erected by Inigo Jones was one of exceeding elegance. Its style had been repeated in the Strand front by Sir William Chambers, and again at Oxford; and there was an imitation of it in the Commercial Sale Rooms in Mincing Lane: but, wherever it had been repeated, it had always been deservedly admired for the simple elegance of its taste and the beauty of its building. It was destroyed, however, in order to make room for the great offices constructed by Sir William Chambers, which were begun in 1766. Sir William had been the favourite architect of George III. He was not an Englishman but a Swede, and his title was Swedish; and the patronage of the King and the Government enabled him to create these buildings, which were, to a certain extent, in an unfinished state, until their friend, Mr. Pennethorne, following Chambers, had the good fortune to finish them. It was for a very long time a reproach to us, that so fine a building should be left on the west side in an imperfect state. Now, however, the Goverment had taken the matter in hand, and placed its completion in the hands of a man of skill, judgment and taste. Mr. Pennethorne told him, that he came to London in 1820: and being a relation of Nash, very soon by his talent, energy, and attainments, assumed an important place in his office. [The noble Chairman—These are your statements, not his]. (Laughter). Nash succeeded J. Wyatt as Surveyor-General, and after that the appointment became a good deal broken up and deranged. Nash was certainly one of our boldest improvers, and although his style of architecture possessed anything but boldness, yet his style of dealing with the metropolis possessed a boldness, which we should do well in the present day to imitate. (Applause). To him and our excellent friend Mr. Pennethorne we owed the fine range of Carlton Terrace. There were many, who would recollect old Carlton House, and the idea of building a range of palaces there in its place was at once grand and effective. Many would also remember Old Swallow Street; and when they called to mind the magnificent street that now occupied its place, they would be able to appreciate the talent, and skill, and energy of Nash. In those days speculative builders scarcely existed as a class; and, but for the energy of Nash, the great improvement of Regent Street would never have been carried out. He did not say, that it was the finest piece of architecture in the world: but as a *tout ensemble*, no improvement in street architecture was of a better general character than that of Regent Street; and when we recollected what London was, the difficulties there were in the way, we should accord to Nash the highest approbation. When Nash became advanced in years, Mr. Pennethorne carried through most of his works; and since then, as architect to the Government, many millions had been spent under his superintendence. He had also distinguished himself under the difficulties, that were inseparably connected with the profession. A part of the business of an architect, and a singular one it was, was that of arranging for the purchase of masses of property. He (Mr. Tite) had had a great deal to do in this way, both with Mr. Pennethorne and Mr. Hardwick: and in some cases it was a very difficult matter to preserve one's temper (a laugh) and to secure the good will and feeling of the large mass of the profession, as his friend Mr. Pennethorne had succeeded in doing. Mr. Pennethorne informed him that in the case of one improvement where £1,000,000. was involved the property resold at £200,000. That was in the main line of improvement in the east at Shoreditch: which fell from the hands of Nash to Mr. Pennethorne. It was a main line of improvement of the greatest possible importance, and, in addition to it were the Victoria and Battersea Parks, which were also highly creditable to the taste and skill of Mr. Pennethorne. The sum, these improvements had cost, was very considerable, and every one felt that the money had been expended usefully, economically, and gracefully. (Hear, hear). He could only have wished that the spirit, displayed in these improvements, had generally been kept in view and gone on with. It was one of the notions and misapprehensions of the day to say that new brooms sweep clean. Every new broom began sweeping away, but, unfortunately, it did not sweep over the right line of crossing. (Laughter). But a great deal of this was owing to changes in political appointments, which involved alteration in all these things, and which led to much inconvenience. This, however, might be considerably alleviated, if a more distinct and well-chosen plan, as in Paris, were followed out. He might refer to many other of Mr. Pennethorne's public works, but he would conclude by reading the proposition for the proposed testimonial to him. He (Mr. Tite) trusted that the Testimonial, which they wished his Lordship to present to him (a Gold Medal with the head of Chambers on the one side, and his great work on the reverse, subscribed for by individual members of the profession), would be deemed a fitting token of the sense entertained by his compeers of Mr. Pennethorne's completion of a great building, which was a credit to our metropolis, and of their sense also of his worth as a man and a gentleman. (Loud applause).

Mr. Tite then proceeded to read the letter, signed by seventy-five leading members of the profession, in which was communicated to Mr. Pennethorne the desire to convey to him this mark of consideration and respect. In concluding these few remarks, and in asking his Lordship to present to Mr. Pennethorne this medal, he begged to add that the subscribers desired to record their estimate of the abilities and the merits of their friend as an architect, and also their sense of his distinguished qualities as a gentleman and a man of honour. (Loud cheers).

Professor COCKERELL—My Lord, the merits of my friend Mr. Pennethorne have been so well set before you by Mr. Tite, that it is not so much a matter of favour as a matter of justice, which is to be done to the honourable gentleman, who has been a most efficient officer of the public for so many years. (Cheers). I am, so to speak, of the family of my friend Mr. Pennethorne, at all events I belong to the same school with him. Mr. Nash was his master, Sir Robert Taylor was the master of Mr. Nash, and Sir Robert Taylor was the master of my father. And I rejoice to see Mr. Pennethorne here to-night as the representative of the school to which we both belong. (Cheers). Your Lordship may remember the difference of opinion as to the merits of Mr. Nash. He may have had his defects. But what a courageous man he was! And it should not be forgotten, that when persons of merit and position recommended the covering of Regent's Park with closely packed buildings, which would give to the Government a high rental, Mr. Nash advocated and effected the leaving the space clear as it now is: and the formation of Regent Street—a street of palaces and buildings such as we are not likely to get up again. (Cheers). It is to be regretted that we have not a proper biography of that eminent man, of whom I could tell you many curious traits. (Loud cheers). Now, my Lord, as a veteran in the profession, I must acknowledge to the fullest extent the claims of Mr. Pennethorne to your regard, and I can only regret that my friend Mr. Nash is not here, because, if he were, he would no doubt imitate the habits of our friends in France, where, when a pupil is receiving his gold medal, he always goes to his master and embraces him. (Laughter). Nothing can be more graceful, gentlemen, than this custom; and I regret that Mr. Nash has not been spared for this occasion. (Cheers). My Lord, I have trespassed, I am afraid, too much upon your time, and I now beg leave to second the resolution. (Cheers). I may add that it is with extreme pleasure that I have seen my friend Mr. Owen Jones receive the gold medal on this occasion. We all know how fully it is due to him, and how much we owe him in our professional studies. (Loud cheers).

Mr. Mayhew.—My Lord, as the District Surveyor of Saint James's since the year 1832, I cannot help bearing testimony to the scientific knowledge and ability of Mr. Pennethorne in the works, which he has carried on in that parish, and particularly to his design for the Geological Museum. That was a very great work; it required great knowledge and skill: and I can only say that everything there, which was conducted by Mr. Pennethorne, redounded very highly to his credit. Feeling this, I cannot sit still without adding my testimony to the merit of Mr. Pennethorne. (Loud cheers.)

Earl de Grey.—It is almost lowering a memorial such as this to put it in my hands to present it, Mr. Pennethorne, to you. It is, however, offered to you by your professional brethren, who have more opportunities of knowing your abilities than I have. I am merely acting on their behalf. At the same time, it is a proud situation for one to be placed in, who is not a professional man, on an occasion like this. I have great pleasure in being the medium of presenting to you one of the most touching instances, that can be afforded, of the approval of the members of your profession. With regard to the reference made to your late relation, Mr. Nash, I may say, that it is now nearly thirty years, since I had first the gratification of being connected with him. I think it was in the year 1827, when the United Service Club was being built under his charge. He was the agent of the Crown, and I was a member of the Committee of that Club. We felt that with regard to the exterior of that great building, it being a part of Carlton Place and Waterloo Place, the external design should be left entirely to Mr. Nash. But, with reference to the interior, I cannot forget the kindness with which Mr. Nash received the observations made by the Committee. I, myself, suggested changes which Mr. Nash might not have approved, and I never met a man who allowed his projects to be modified by those, who were not professional, with greater forbearance and gentleness than by him. Mr. Pennethorne, I have great pleasure in presenting to you this testimonial, and I fully concur in the praises, which have bestowed upon your great work in the completion of Somerset House. (Cheers.) I have often wondered when and how it could be finished: and when I drove past it the other day on my return from Dover, I was very much struck by the beauty of the execution of the front, which you have added to it. (Cheers.) I have the greatest pleasure in being the instrument of conveying this medal to you. I have, myself, no right to offer it. It is given to you by your brethren—the gentlemen of your own profession, with a total want of anything like professional jealousy, doubt, or anxiety, and I can only say that I have the greatest pleasure in being called upon by them to be instrumental in paying you this compliment.

Mr. Pennethorne.—My Lord, I can only sincerely thank the Institute and the gentlemen present for the peculiar honour and great compliment they have conferred upon me, and if I spoke for an hour I could not say more. Nine months ago, I received, through my friend Mr. Angell, the first intimation of this compliment. I was totally unprepared for anything of the kind, and being fully conscious of my own imperfections, of which no man is more aware than myself, I was perfectly astonished at such an expression of kind regard; the more so as it has been my misfortune, owing to living in the country and other circumstances, not to associate with my professional brethren as others have done; nor to attend the meetings of this Institute. It came, therefore, with double force upon me, when I was told that my professional brethren did hold me in their esteem. And I never can cease to feel the utmost gratitude to the gentlemen, who signed the paper, which has been read. Much has been said to-night extremely complimentary to myself, but I should first like to say a few words in reference to what has fallen from Professor Cockerell, Mr. Tite, and from the Noble Chairman, with regard particularly to the late Mr. Nash. After Mr. Nash's death, there were differences of opinion as to his merits. After a period, therefore, of thirty years to hear his works spoken of as they deserved, is to me most gratifying. Everybody in this room will acknowledge, that it was Mr. Nash in whom originated the spirit of improvement in architecture in this metropolis, which has since produced so many great works. And there are many young men in this room, who will in consequence carry architecture in this country to a greater degree of perfection than any other school in Europe. I believe that English architects, like English engineers and other classes of professional men, will become superior to those of any other country. The progress of architecture is already displayed by the works shewn in competition for the Constantinople Church, and by the Liverpool competition, as well as in that which is now upon view for the Public Offices at Westminster Hall. I am thankful to Mr. Tite and to Mr. Cockerell for giving to Mr. Nash that praise, which is his due. And I have to thank his Lordship for the very kind manner in which he also has spoken of him, as well as of myself. And I may be permitted to state, respecting the Museum of Economic Geology, which Mr. Mayhew has mentioned as having a good front, that the design was much benefited by his Lordship's suggestions, he having been consulted by Lord Carlisle on the subject. I was also under great obligations to his Lordship, as Lord Lieutenant of Ireland, when I was sent by the Government to that country. In reference to the buildings I have constructed, it is not for me to speak: but as respects Somerset House, my endeavour was to follow scrupulously the spirit of Sir William Chambers, and I felt it my duty to endeavour to carry out that building in the manner I supposed he would have done. I was compelled to put an attic story to it, which has been criticised; but it was one of the requirements of the establishment. If I should be employed hereafter on any public work, I can assure you, that the compliments which have been paid me to-night, will make me ten times more anxious to continue to merit the good opinion of my professional brethren. (Cheers.) With regard to the metropolitan improvements of which I had the controul for seventeen years, I am much gratified by the opinions, which have been expressed to-night. They have been, by Act of Parliament, transferred to the Metropolitan Board of Works, and hereafter I suppose all public improvements will be under their controul and management. Though that Board may not exist as at present constituted, it will in some form or other; and there is no man better qualified to carry out the great improvements required than the present architect of that Board. (Cheers.) I esteem most highly the expressions of goodwill from my friend, Mr. Tite; because there is no one in London, whom I have met more frequently adversely than him. (Cheers and laughter.) Yet there is no man, who has shewn more strong sense, better feeling, or more uprightness; or with whom I have had less difficulty in coming to conclusions than Mr. Tite. (Cheers.) I should like also to allude to my friend, Mr. Cockerell, who has spoken as being professionally of the same family as myself. I wish I could claim that in a nearer sense. When I was a young man going abroad, the then young Robert Cockerell had just returned from foreign travel with a high reputation. I was recommended by Mr. Nash to go to him, and by his urgent advice I paid more attention to the palaces and modern architecture of Italy than to the works of ancient art. Unfortunately, I did not go to Greece, and could not therefore there study Grecian art: though I consider it the purest and finest architecture in the world. What I did study I owe to Mr. Cockerell. (Cheers.) I fear that I have trespassed long upon your time, but this subject has dwelt for months upon my mind; it must be uppermost with me to the day of my death, and I cannot sufficiently express how strongly I have, and do feel it—and I again desire to return my thanks to every person in this room—to the Institute, who have added increased value to the medal by allowing it to be presented here; and to his Lordship, whose gracious manner has added very considerably to the honour, that has been conferred upon me. (Loud cheers.)

Mr. Pennethorne *holds two Appointments, being Architect to the Commissioners of Her Majesty's Works, and also to the Commissioners of Her Majesty's Woods.*

1820. Mr. Pennethorne, who is a native of the City of Worcester and came to London in February 1820, was educated for his professsion by the late Mr. Nash, and as his clerk, he then began to be known at the Office of Woods.

1828. Mr. Pennethorne, having returned from abroad, became Mr. Nash's principal Assistant, and in that capacity, was employed and entrusted to a great extent with the Strand Improvements, the building of Carlton House Terrace, the laying out of St. James's Park, and other Public Works, which required constant communication on his part with the Board of Woods.

1832. Mr. Pennethorne was first employed by the Commissioners of Woods as an independent professional man, and has ever since (now 24 years) been more or less employed by them.

1838. Mr. Pennethorne this year submitted to a Select Committee of the House of Commons Plans for the Improvement of the Metropolis, which were approved and recommended by them for adoption: whereupon he was appointed, in conjunction with Mr. Chawner, then one of the joint Architects of the Board of Woods, to prepare the necessary Plans and Estimates for carrying them out, Mr. Pennethorne being considered fully qualified by the experience he had obtained in such undertakings under Mr. Nash.

1839. In this year, the Plans and Estimates prepared by Mr. Pennethorne and Mr. Chawner were approved by a Committee of the House of Commons, an Act was passed to carry them into execution, and by the same Committee, in communication with Lord Duncannon, the then Chief Commissioner of Woods and Works, it was arranged, that Mr. Pennethorne and Mr. Chawner should be remunerated according to the agreement made with Mr. Nash for the Regent Street and other Improvements conducted by him.

1840. In June this year, Mr. Pennethorne was appointed joint Surveyor of Houses in the Land Revenue Department, in the place of Mr. Rhodes, who retired, at a salary of £ 100. per annum, and upon the other terms of remuneration settled in 1825; and upon this agreement Mr. Pennethorne has ever since continued to hold the appointment. From this year Mr. Pennethorne began to decline the private practice of his profession.

1843. In October of this year, Mr. Chawner retired, and Mr. Pennethorne has ever since continued to perform alone all the duties of Architect of Works and Surveyor to the Woods and Forests, upon an understanding with the Commissioners, that he should from that time entirely abandon his private practice.

1845. In December of this year, by Minute of the Treasury, Mr. Chawner was placed on the retired list of the Department with a retired allowance of £ 500. per annum, to take effect from Christmas 1843. By the same Minute, the Treasury desire it may be understood, that Mr. Pennethorne was not to be at liberty thereafter to engage in private professional business of any description, and that the retired allowance to be awarded him, when incapacitated for the public service, will have reference to the length of time engaged in the exclusive employment of Government, and to the other circumstances of his service. The appointment of joint Architects had been found to be productive of difficulties and dissension. On the return of Mr. Pennethorne from the Survey of the Workhouses in Ireland, early in 1844, he was given to understand that he would be continued as sole Architect, provided he conducted the very many and important increased duties which would from that time devolve upon the office; and upon this understanding, Mr. Pennethorne has performed the duties alone ever since October 1843, now 12½ years.

The Public Improvements upon which Mr. Pennethorne has been employed by the Board of Works (exclusive of the duties performed by him as Surveyor of Houses in the Land Revenue Department) have been the following:

1. The four lines of Metropolitan Improvements authorized by the Act 3 and 4 Vict., cap. 87. commenced in 1840, in conjunction with Mr. Chawner. The amount of property purchased for these lines was not less than £ 727,818; the total expenditure was not less than £ 1,000,000.; and properties were also let or sold of the value of not less than £ 200,000.
2. The Shoreditch Improvements, yet in hand.

3. The formation and laying out of Victoria Park. The properties purchased amounted to £87,298.; the total expenditure was £115,000.; and the Park was laid out entirely from the designs and under the superintendence of Mr. Pennethorne alone.
4. The formation and laying out of Battersea Park. The properties purchased amounted to £228,800.; the total expenditure to the present time has been £281,000.; and the laying out of the Park is now in a very advanced state, entirely from the designs and under the sole superintendence of Mr. Pennethorne.
5. All the Plans and Estimates preparatory to going to Parliament for the proposed Albert Park at Islington.
6. The formation of the Street from Lower Sloane Street to Chelsea Bridge, and the valuation of properties required for the Chelsea Embankment.
7. The Pimlico Improvement.
8. The laying out of the Kitchen Garden at Kensington for building purposes, letting all the lands and conducting the whole undertaking from the commencement to the end.
9. The Improvements of the Town of Windsor.
10. In addition to the above, Mr. Pennethorne, as Architect to the Commissioners for the Improvement of the Metropolis, made plans and valued properties, from 1844 to 1850, to an enormous extent. And also as arising out of these, made correct and detailed plans and schedules preparatory to going before Parliament, for the Victoria Park Approaches, the Southwark Improvement, the Covent Garden Improvement, the Carey Street Improvement, the Kennington Common Enclosure, and others.

The Public Buildings upon which Mr. Pennethorne has been employed since 1843, *have been:—*

1. The rebuilding of the Stables at Claremont, at a cost of £8,595.

1A. The Alteration of the Quadrant, Regent Street.

2. The Museum of Economic Geology in Piccadilly, at a cost of £29,572.
3. The Additions to the Ordnance Office in Pall Mall, at a cost of £20,165.
4. The General Record Repository in Fetter Lane, at a cost (including Fittings) of £78,606.
5. The New Stationery Office at Westminster, at a cost of £25,792.
6. The New West Wing of Somerset House, at a cost of £81,123.
7. The Additions to the Liverpool Post Office, at a cost of £13,120.
8. The Offices for the Council of the Duchy of Cornwall, at a cost of £9,609.
9. The South Wing of Buckingham Palace, at a cost of £77,655.

In addition to the above, Mr. Pennethorne was directed in 1849, to make elaborate Designs for an enlargement of the present National Gallery, by building over the whole site of the St. George's Barracks. Also in 1851, to make Designs for a new Gallery to be built upon a site in Kensington Gardens. Also in 1854, to make several elaborate Designs, to be laid before Parliament, for new Public Offices to be built in Downing Street; including a Model of the Building, and completely arranged finished Drawings of both exterior and interior of the portion thereof intended for the Foreign Office. In 1855, he was directed by the present Chief Commissioner of Works, to make finished Plans and Elevations, to be laid before Parliament, of new Public Offices for Downing Street, upon a site extending south all the way to Great George Street. And in December 1855, he was also employed to make Designs and Estimates for the new War Office then intended to be built in Pall Mall.

Among the Private Works, executed by Mr. Pennethorne between 1832 *and* 1840, *may be enumerated:—*

The Bazaar, St. James's Street, for William Crockford, Esq.
Christ Church, Albany Street.
Trinity Church, Gray's Inn Road.
Lamorby House (enlarged) and Chapel for John Malcolm, Esq.
Swithland Hall, Leicestershire, for Butler Danvers, Esq.
Dillington House, Ilminster, for John Lee Lee, Esq.
St. Julien's.—The Right Honourable J. C. Herries.
House at Newmarket for William Crockford, Esq.
The Design submitted by Mr. P. for the Royal Exchange was one of the five selected.

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AN ATTEMPT TO DETERMINE THE PERIODS, IN ENGLAND, WHEN FIR, DEAL, AND HOUSE PAINTING WERE FIRST INTRODUCED; WITH REMARKS ON THE PROCESSES OF THE LATTER.

By Wyatt Papworth, Esq., Architect.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, November 2, 1857.

It has been supposed that the timber seen in old buildings is almost generally oak; but it will be found on investigation, that many other kinds of wood were used, a knowledge of which, tested as they have thus been in trying positions, would be highly serviceable to the architect and to the builder. From records quoted in Mr. Turner's "Domestic Architecture of England,"* it appears that in 1253, temp. Henry III, the bailiffs of Southampton were commanded to buy two hundred Norway boards of fir to be used at Winchester for wainscot; that in 1255 one thousand Norway boards were purchased for wainscoting certain rooms in Windsor Castle, and that a house of deal was to be made, running on six wheels and roofed with lead. The word used, "*sapo*" or "*sappo*," has been translated "deal;" this latter is stated to be derived from the Dutch, *deelen*, or German, *dielen*, "firwood," which would perhaps be the better translation of the word "sapo."† Turner gives his opinion that "the wood ordinarily used was fir, possibly because it was cheaper and more easily worked than oak," and that "Norway planks were largely imported into this country from an early period of the 13th century, and perhaps, although it is not quite so clear, at a still earlier time." His authority for these remarks appears to me very slight; but he has in his favour the fact that treaties "for the benefit of trade" were made by Henry III. with one or two of the kings of Norway; the use of the timber however would appear (from these records) to have been confined to the Royal works. Deal boards bought for doors and windows, are mentioned between 1272 and 1307. One of the halls appropriated for the royal seat at the coronation of Edward II. (1307), was therefore ordered to be covered with boards "de sapo." The wardrobe accounts of Edward IV. (1480), mention "cofyns of fyrre" for the carriage of the king's books to Eltham.

The above extracts show that fir timber was imported at that early period; and omitting the last record, we must now pass over an interval of about two hundred years to the next date. The first statement I have been able to find of the actual importation of timber is as late as 1517, temp. Henry VIII, when the Dutch in particular were accused of bringing over iron, timber, and leather, ready manufactured. During that monarch's reign the scarcity of timber began to be experienced, and several statutes were passed for fixing the price of barrels, requiring the importation of clapboards for their manufacture; and for the preservation of the forests of England, but excluding the counties where iron works had been carried on from very ancient times. Queen Elizabeth (1558-1603) having reduced the forests still further, passed subsequent acts for their future preservation. Mr. Clayton, in his work on the ancient timber edifices of the western part of England, states that the timber buildings (of this period, that of the 16th century) were invariably constructed of oak, of extreme durability; and the often quoted writer Harrison (1573), in the reign of Elizabeth, says, "the wals of our houses on the inner sides be either hanged with tapestrie, arras worke or painted cloths—or els they are seeled with oke of our owne, or wainscot brought hither out of the East countries;" and in another place, "in times past, men were contented to dwell in houses buylded of sallow, willow, plum tree, hard beame, and elme, so that the use of oake was in a manner dedicated unto churches, religious houses, princes' palaces, noblemen's lodgings and navigation; but now all these are rejected and nothing but oke anie whit reguarded." It will be observed that fir is not mentioned. During the last years of Elizabeth's reign, cottages and farmers' houses were building in all directions, and in London the progress of building was likened to an inundation. Large quantities of timber were thus needed, as brick had not yet been adopted for general use.

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* The omission in this work of information as to the exact kind of wood used in the different buildings referred to, is the more to be regretted, as the author of the second volume states that he had visited every place he describes.

† French, Sapin.

Although without any historical record of the fact, it is to about this period (1558-1603), and to the above-named causes, that I should attribute the general introduction of foreign timber as an article of commerce; in 1553 (1st of Mary) the English discovered Archangel, and in 1560 commenced trading to Narva, then belonging to Sweden. The fitness of fir and other woods for building, is set forth by an English writer in 1586, seventeen years before the death of Elizabeth:—"Fir timber is meet for divers workes, and greatly esteemed for his height and bignesse, whereof are made the ship masts and pillers for houses, for it is very strong and able to abide great force. It is used also in building, for great gates and door posts; in fine, good for any building within, but not so well enduring without doores, and very soone set a fire.—The firre, the poplar, the ash, and the elme are meet for the inner parts of the house, but they serve not so well in the weather as the oke doth. The best to bear weight is the fir and the larch, which howsoever you lay them will neither bend nor break, and never faile till wormes consume them.—Ash for thin borde; the best to clean, the firre, the poplar and the beech." In or about 1603 Sir Walter Raleigh presented to James I. some observations on trade and commerce, showing how the Dutch had engrossed the transport of the produce of other countries, and stating that "the exceeding groves of woods are in the East Kingdoms, but the huge piles of wainscot, clapboard, fir, deal, masts and timber, is in the Low Countries where none grow, wherewith they serve themselves and other parts, and this kingdom, with those commodities." From other accounts it appears that for about seventy years a very considerable trade had been carried on with Russia—(Archangel, as above stated, was discovered by the English in 1553), and that down to about the year 1590 a large number of ships sailed annually to that country; but in 1600 only four had been sent out, and in 1602 only two or three; whereas the Russian trade of the Dutch employed from thirty to forty ships each as large as two of the English, and all chiefly laden with English goods. Though the above shows the extent of the trading, yet a pamphlet, published sixty years later, in 1662, whilst describing the produce of Russia, mentions oak as the only timber exported. By the year 1638 Germany, Prussia and Norway, all sent timber and deal boards. In 1662, Charles II. interdicted the importation from the Netherlands and Germany of deal boards, fir, timber, and other articles, upon any pretence whatsoever.

Besides a panel, to which I shall refer presently, and the date whereof is somewhat uncertain, the earliest instance of the actual use of deal I have been able to find, is in the description of Wimbledon Hall, erected in 1558 by Sir Thomas Cecil. This building became about 1640 the property of Queen Henrietta Maria, and was surveyed by order of the Parliament, in 1649. The accounts do not state whether any repairs were made in the sixty years between the date of its erection and the survey. If the deal, therefore, which was introduced so largely in the floor boards and wainscoting was not in the original erection, we must infer that the house was put into repair or modernised near the middle of the 17th century, when it was prepared for the queen; I am in favour of the deal having been used in the original erection.

The survey, occupying over fifty pages of the tenth volume of the Archæologia, describes how each room was paved, lighted and ceiled; whether wainscoted, coloured or plastered; what fixtures remained therein; concluding with the state and extent of the gardens and buildings, the park, and erections belonging to the estate. The use of deal for floor boards, wainscoting, wall linings, presses, &c. frequently occurs in the account, which time will not permit me to give at length. Among the exterior buildings a pheasant garden is described, severed from the park by a pale of deal boards 10 feet high. The land of Richmond Palace is likewise described as part fenced with brick, and part with deal boards.

Another early instance may be obtained by inference, in Brandenburgh House, Hammersmith, erected about the beginning of Charles the First's reign (say 1630) by Sir Nicholas Crisp, the materials of which were sold by auction in 1822, *the dry rot* having got into the timbers. (Falkener's Hammersmith, edit. 1839.) Sir Bulstrode Whitelocke, Ambassador to Sweden in the time of Cromwell, on his return in 1654, brought a cargo of deal boards, which he mentions in his journal to have been used at Fawley Court for new flooring his hall and for wainscoting it.

Respecting the asserted practice of 'painting' during the 13th century, Turner says a few instances do occur of directions to paint the woodwork, but in a note he adds that the chapel built by Henry III. (1216-72) at Windsor, had a wooden roof formed and colored to imitate one of stone at Lichfield, and that wooden and stone posts or piers and arches were painted marble color, as were those of the halls of Guildford and Ludgershall. During this century, the ordinary custom was to decorate in paint or color the wainscoting with patterns or subjects taken from sacred or profane history. Green was the favorite color, very frequently starred with gold, with borders of a different pattern, male and female heads, &c. This wainscoting being generally only 5 or 6 feet high, the wall or plaster above it was painted in fresco or in water, to represent some history, or a curtain. The Queen's chamber at the Tower was to have the walls whitewashed and pointed, and within those pointings, painted flowers; the next year the same chamber was to be thoroughly whitened internally and newly painted with roses; also the King's own chamber was to be entirely whitewashed. But this was not confined to internal work, for in the following year the King directs that water pipes should be put up to the great tower, so that the wall of the said tower which has been newly whitewashed, might be in nowise injured by the dropping of rain water, nor be easily weakened. Even the chapel of St. Catherine in Nottingham Castle was to be whitewashed on every side and pointed lineally: directions are also given to whitewash within and without the King's chapel, the Queen's chapel and chamber, and the Queen's great wardrobe, all at Guildford, where the hall also was whitewashed. Whitewashing would appear to have been then almost a royal luxury; though not wholly so, for evidence is found that during the 13th and 14th centuries the citizens of London not only whitewashed their walls but were compelled by the magistrates to do the same to the thatch of the roofing, as a precaution against fire. White lead and oil, with fine and inferior varnishes, were also extensively employed in this period for the decorations. Turner in support of external painting states that the habitable buildings being of timber, it would require painting in some way to be preserved from the weather, for although park palings will stand for almost any length of time, yet carved woodwork, and even plain timber when mixed with plaster, require painting. He appears to have formed this opinion upon the present mode in Lancashire and Cheshire, of painting (coloring?) the timbers black and the interstices white. Clayton says "it would seem probable, from the appearance of the timbers in many of these buildings (the Town Halls of the 16th century) that their surfaces were originally protected by a description of paint, of a rich brown color; it is, however, extremely uncertain whether the practice of blackening them as usually done in the present day can be traced to ancient origin." The following extract from a record, dated 1574, will remove any doubt on the point; "the plastering and whitening the forefront of my M^{r} his house in Coleman Street, and the courte, with the blacking of the timber work, 42s. 6d."

The extensive employment of tapestry in the 14th and 15th centuries would appear to have allowed the whitewasher to rest, except for the ceilings which were 'white-limed' as usual; a few walls, however, were white-limed even in Elizabeth's reign, but then they were decorated with poesies and moral proverbs on fantastic labels, of which Leckingfield furnishes so profuse an example. At Hardwick Hall, 1570, the walls of the state room are divided at about half the height by a stringing, the upper part filled with landscapes, figures and animals relieved in plaster, and painted 'all proper' on a white ground; the lower division hung with tapestry: the oak panels of the wainscot of one of the rooms are all marked in gold with the Stafford knot, the cognizance of that family. The survey already mentioned of Wimbledon Hall in 1649, states that the oak wainscot was varnished green with gold stars, crosses, &c.; or colored with 'livor color' and varnished; or varnished white filletted with green; and it consequently may be inferred from the absence of all description to the contrary, that the deal so much employed was left plain. "The 'knotts' in the garden are compassed about on three sides thereof with very handsome rails, piked with spired posts, in every corner and angle, all of wood, varnished with white, which very much adorns and set forth the garden." Oil painting is thus not noticed.

As a probable illustration of the use of deal in the reign of Elizabeth, and also of this mode of decoration, Mr. Reynolds Rowe of Cambridge has forwarded the panel of fir now on the table: it originally had a ground work of vermillion, in the centre of which was a pattern laid on in gold of a good thickness. This panel formerly belonged to Swavesey Manor House, in Cambridgeshire, temp. Elizabeth, which still contains some of the same kind of work, probably under the coat of white paint of a later period, bits of which are still to be seen on the specimen.

In connection with this period reference may be made to a small octavo volume, by Stephen Primatt, published in 1667, the year following the Fire of London, and evidently intended as a guide to builders. Describing the finishing of the various classes of houses illustrated; he specifies that the walls of each floor are to be 'plastered and sized'; the partitions to be 'lath, plaster and rendered and sized.' Painter's work is described "for a fair stone color laid in oil for windows, doors, rails and banisters for staircases, shop windows and modillions 12*d.* per yard, being colored over thrice. For a timber color in oil over doors and windows 9*d.* per yard. For a door painted on one side with a stone color 12*d.* a yard, and for a light of a window 6*d.*; for a lead color in oil 9*d.* or 10*d.* a yard. Painter's work of ordinary lights of windows in oil at 6*d.* per yard or 3*d.* per light. For painting the best cerulean or blue color in oil 1*s.* 6*d.* per yard;" this is the only expensive color mentioned, and seems to indicate the origin of a peculiar color for metal work. Whitewashing with size is given as worth 2*d.* per yard.

In 1671 it was agreed that the wainscot in the Hall of the Carpenters' Company should "be handsomely painted, and the walls above the wainscot on the south side hung with painted cloth of some neat painting work suitable to the front side." A French traveller in England in 1672, remarks that "the houses of Canterbury are well built and painted after the Dutch fashion." For many years after 1700 the following description from a work of the period will convey some idea of the extent of painting practised. "Out door painting for doors, shop windows, window frames, pediments, architraves, friezes and cornices, and all other timber work exposed to the weather ought at first setting up to be primed with Spanish brown, Spanish white, and red lead (about a fifth part) to make the other two colors dry, ground in linseed oil; then again with the same color only whiter, and lastly with fair white made of white lead and about a fifth part in quantity, (not weight) of Spanish white. "Wainscot color," "white color," and "walnut color" are enumerated; also "ordinary branched painting" and "plain japan, either black or white." On considering this recital of painter's work

I have thought that these, wainscot, and walnut colors, were used for the purpose of making woodwork resemble those woods. An interesting account has lately been published of a lady of rank, who, in 1612 or 1613 appears to have entirely changed the fashion of the arrangements of houses in France, and to have been the first who painted rooms in any other color than red or tawny. The next and last item in the description is "whiting and coloring on plasterer's work." Here I would request your attention to the continued use of "color" (distemper) for interior work, down to such a late period, (1700) a fact which I conceive at once accounts for the extensive use made of it in our churches. It is clear that from about 1700, oil paint became a disguiser of materials, and we know from his own description* that the interior of St. Paul's Cathedral was painted under Sir Christopher Wren's direction. In a work of 1703, the contrivance of closets in most rooms, and painted wainscot are mentioned as two great improvements. Perhaps the first intimation of oil paint being used to a large extent *internally*, is in a "Compendium" of 1721: it states that the taking of the dimensions for painter's works within doors is the same with that of the joiner's, by girting about the mouldings and members of cornices, &c.; but the painter never requires work and half work as the joiners do, but reckons his work, once, twice or thrice primed or colored over. Wood in his history of Bath says, "about 1727 if the walls of any of the rooms were covered with wainscot it was with such as was mean and never painted,—as the new buildings advanced the rooms were all wainscoted and painted in a costly and handsome manner."

Ware, in 1767, writes that "fir, as it is cheap and works easy, since the use of paint has become so frequent, has in a manner superseded all other kinds." In the descriptions of buildings given at the end of his work, he specifies that the walls are to be rendered and floated for hangings, and paints all the wainscoted rooms a "common or stone colour" three times in oil. In 1775 a large mansion in the country is stated to have paper to the ground floor rooms, whilst the walls of the bed rooms, garrets, and basement were lime-whited. And at the beginning of the present century, says a later writer, the houses of traders and middle classes, particularly in the provinces, were chiefly adorned with simple washings of rose pink, whitening and size. A friend, now in his eighty-fifth year, remembers the lining to walls being often left unpainted, and much of the woodwork even in the rooms connected with the Houses of Parliament were also of plain deal. The plastered walls of houses were coloured, the sashes painted white, the doors, skirtings and other parts generally black. Several present can no doubt recall houses in the country still exhibiting this ancient style of ornamentation. Thus we may conclude that house painting, or as it has been very descriptively termed, the "three coats and flat" work, did not come into fashion until about the period of William and Mary and Anne, up to which time either colouring by distemper or by whitewash had been in vogue for plasterwork, leaving inside wood-work more or less untouched.

In every branch of painting in oil applicable to buildings, the general process will be found very similar, with the exception of such variations as easily suggest themselves to the careful workman. The first essential is that the wood, plaster or cement should be perfectly dry. This is acknowledged by all, and yet when despatch is the order of the day, it must be neglected. One writer goes to the extent of stating, that "perhaps in general cases, where persons are building on their own estates or for themselves, two or three *years* are not too long to suffer the stucco to remain unpainted; though now frequently in speculative works as many weeks are scarcely allowed." The wood-work having been prepared for fixing, has first to undergo the operation of "knotting," in order to prevent the turpentine in the knots of fir-wood, from passing through the several coats of paint. One method for best work is to cut out the knot whilst the work is at the bench, to a slight depth, and to fill up the hole with a stiff putty made of white lead, japan and turpentine. There are many ways of "killing" the knots. The best and surest is to cover them with gold or silver leaf. Sometimes a lump of fresh slaked lime is laid on for about twenty-four hours, then scraped off, a coating of size knotting applied, and if not sufficiently killed they are coated with red and white lead in linseed oil, and rubbed down when quite dry. The general method is to cover the parts with the "size knotting," *i. e.* a preparation of red lead, white lead and whitening, made into a thin paste with size. The most common mode is to paint them with red ochre, which is worth nothing. The next process is that of *priming*, which consists in giving a coat of white lead with red lead, and a little drier in linseed oil. This is the first coat and upon which the look of the paint on completion depends. This first or priming coat is put on before "stopping" the work, should that process be required. It consists of filling up with putty any cracks or other imperfections on the surface of the wood. If the putty used in the process of stopping be introduced before the first coat of colour is laid on, it becomes loose when dry. A good painter after the application of this first coat, removes by pumicing all irregularities from the surface, especially those rendered apparent by the knots and fibres of the wood. A smooth surface being thus obtained, a second coat is given, consisting of white lead and oil—about one-fourth part of turpentine is sometimes added for quick work. If four coats are to be put on, this second one has sometimes a proportion of red lead, amounting to a flesh colour; but if only three, it is generally made to assume the tint of the finishing coat. It should have a good body and be laid even. This coat when thoroughly dry and hard, is in best work rubbed down with fine sand paper, and carefully examined to ascertain whether any further stopping be required; and then the third coat or "ground colour" applied, of a somewhat darker tint than wanted when finished, having sufficient oil for easy working, but not too fluid—thus two-thirds oil and one-third turpentine are employed; or sometimes equal proportions of oil and turpentine. The *flatting* coat follows, the object of which is to prevent the gloss or glaze of the oil, and to obtain a flat dead appearance. The advantage is not confined to the look of the paint, for it hides all defects in the wood or other material that is painted. White lead is mixed with turpentine, to which a little copal varnish is sometimes added, and when the tint is put in it is always made lighter than the ground colour, or it would when finished appear in a series of shades and stripes. Flatting must be executed quickly, and the brush is generally, if not always, carried up the wall and not across it. It must be understood that a flatting coat is not considered as a coat of paint; being wholly of turpentine, it is by exposure to the air evaporated, leaving a thin coat of pigment which is only required for effect, not for use. Some painters, particularly where the work is required to dry rapidly, use a large proportion of turpentine in the several coats; thus the ground coat has two-thirds oil and one-third turpentine. If four coats are to be laid on, the third has a little more turpentine than usual, which in the second is about a quarter, and so on. I would suggest for particular attention that *turpentine* on the whole is chiefly useful for the purpose of saving oil and labour. It should never be employed where really lasting work is required. The necessity of having the substance perfectly dry before it is painted has already been noticed, and it is equally important that each coat of paint should be quite hard before another is applied, more especially where the work is exposed to the sun. When the material is quite dry the first coat is readily absorbed by the wood or plaster. Plaster to be painted requires some additional care in the workmanship itself; unless it be quite good, the lime works out in minute bubbles and destroys the effect of the paint, which can only be corrected by rubbing down and repainting, even then with no great certainty of success. Some persons advocate the use of a priming or of a second coat, made of strong double size stained with some color to mark where the brush goes. The second coat then consists of white lead in all oil, used as stiff as possible; the third coat is made of single size with a little white lead ground in water to mark the course of the brush; and the fourth coat of white lead in two-thirds oil and one-third turpentine, with a little blue black to take off the rawness of the white. Such work as this is now generally repudiated; those in its favour state that it is of equal benefit with a coat of paint for inside, but confess that it is not so for outside work. Its objectors state that such "sheepskin" coats prevent the paint from sinking into the wood or plaster, causing the paint to peel off and chip; I fear that it is much practised in inferior work. When inside work has to be finished of any color, it becomes necessary to provide for it at the third or second operation, according to the number of coats; particularly if the work is to be finished flat, or as it is termed, dead white, grey, &c. All new *outside work* should be primed a flesh color, mixed in all linseed oil. The second coat may be of the same mixture if four coat work is to be done; and in this coat all defects are to be made good. If three coats only are to be applied this one should be laid on with care. The third and fourth coats, whichever may be determined upon, are generally white, stone color, lead color, chocolate, olive and invisible green, all in linseed oil. When white lead is employed alone, it has been recommended to dilute it with half drying or boiled oil, and half linseed oil, as the boiled oil affects the color of the white lead a little, but in all other colors boiled oil may be considered the best for the purpose of preservation. When it is required to cover a painted material, or "to repaint," the surface must be prepared to receive the coats of paint; it is sometimes first washed, or if the work be very greasy, turpentine is used, after which the paint is rubbed down with pumice stone and water, or with some potash in it, until an even surface is obtained, removing any knobs or imperfections in the previous coatings. In repainting, the first coat is called "second" coloring, the old work being considered equal to a primed state. It is composed of white lead, turpentine and oil, with the pigment required for the color that may be wanted. Some painters use two-thirds turpentine and one-third oil; others three-fourths turpentine and one-fourth oil; and even all turpentine, dryer, and a very little red lead; but this last must be worked very quick, crossed once, and laid with the grain of the wood, as it is not much better than a flatting coat. For third coloring or finish, the white lead is thinned with half turpentine and half linseed oil, dryer, and a very little blue black, to take off the rawness of the white and also to make it cover better. For the best rooms the flatting coat is required as before described. Two coats of new paint is frequently sufficient for ordinary work where painted previously. Light colored work, as margins, rails and so on, is generally painted before the darker work, as mouldings, &c. Carved work especially requires care to prevent the work being clogged up.

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* See his pamphlet in answer to alleged "Frauds and Abuses at St. Paul's."

Where the face of old work presents a very bad and uneven appearance from blisters or other causes, the inequalities are filled up with a cement. Modern specifications often require that the woodwork should have four or more coats until the paint "bears out." This is certainly necessary when it may be anticipated that little oil will be used, or where the priming and early coats may not have been properly attended to. The result is a deadness in one part, the glaze continuing in another. It often happens too, that the sun and air has quickly dispersed the greater part of the most valuable quality of the paint, *i. e.* its oil, and the work presents the same flatness. Care is also required when constantly painting in chocolate or black; if these are made too thin with boiled oil blisters occur, which causes the paint to peel off and leave the wood almost bare.

Painting plaster work demands a few observations. White lead and linseed oil with some litharge as dryer, are mixed to the consistence of thin cream, and applied; the oil is entirely absorbed into the plaster in a few hours. This coat will perhaps be sufficiently dry in a day or two, when another, a little thicker, is given, the oil of which is also wholly or only partially absorbed, according to the nature of the plaster. In a few days a third coat can be applied, made rather thick, and (according to the absorption of the oil from the second coat) one fourth or less of turpentine is added, and likewise the pigments approaching to the tint required. Should the plaster be thoroughly saturated, the flatting or finishing coat is applied as before described. When very durable work is required, a fourth coat is put on, thinned with equal proportions of turpentine and oil, and then the flatting coat. If the plaster be not flatted, the last coat is made of two parts turpentine to one of oil. By thus painting, plaster is rendered incapable of absorption, and its surface becomes hardened by the oil to a depth of about an eighth of an inch, rendering it less brittle, and enabling the surface to be washed. To effect absorption quickly, painters sometimes give the plaster two or three coats of boiling linseed oil, which are soon absorbed, and then give it the other coats of paint.

The substance generally constituting nine-tenths of the body of paint, is carbonate of lead, commonly called white lead, the quality of which is therefore of the greatest importance to the durability of the work. White lead is said to improve by being kept for several years before use. Besides the three qualities manufactured, six or more chief modes of adulteration have been recorded: 1, by carbonate of lime, as chalk, whiting, &c.; 2, sulphate of lime, as gypsum, selenite, plaster of Paris; 3, carbonate of baryta; 4, sulphate of baryta; 5, pipe and other clays; and 6, starch, flour, &c. Fine whiting ground in oil is very difficult of detection; it not only renders the paint a much less compact body, but causes it to be more easily acted upon by the atmosphere, thus blanching it and destroying it by repeated washings. These adulterations will in some measure account for the great difference that exists in the prices of painters' work. The other metallic white paint now used is zinc white, well known for its intense whiteness, its resistence to sulphurous and other deteriorating causes, and its harmless qualities to the painter and the inmates of the house under decoration. It is requisite that the oil used should be as white as possible, all the brushes and pots well cleaned with spirits if they have been used before for white lead, and driers or colours with a lead basis should not be mixed with it. Zinc white possesses less body than white lead, and great care is requisite that the colour when ground in oil is of sufficient consistence to be laid on a flat surface without showing through; for in that state any oil in excess will form a slight glutinous coating on the surface, retaining every particle of dust brought in contact with it, until it has evaporated. In general this white will not dry so quickly as the older color, but this defect is remedied by the application of proper drying oils. With these precautions a few trials will enable any painter who chooses to work zinc white to overcome the difficulties which appear at first to condemn the invention. It is asserted that in consequence of the great durability of the colour of this paint, a house painted with it may be washed for a succession of three, four, and even five years; and that after each successive washing, the surface will be found as clear and bright as when fresh painted.

Clearcole has already been referred to in conjunction with coats of oil paint. It is a cheap mode of painting, when used alone, for servants' rooms, kitchens, and such like places where despatch is necessary, or when it is necessary to paint often. The old work should be well cleaned and dried; and then a mixture of white lead, ground up in water and mixed with size, laid on; this will dry directly. For finishing, the white lead is mixed in half linseed oil and half turpentine, and used as stiff as possible; blue black, or some colour, and a little dryer, are requisite.

The use of distemper is older than that of oil and varnish. Whitewashing is a kind of distemper, especially when size is used with it. The extracts from the records in the former part of this paper have no doubt reference to this kind of painting, and the word "color" would be more applicable as a translation than "paint," which is generally used. Common distemper color for walls is Spanish white, or whiting, broken into water, to which is added strong size whilst warm, and then allowed to cool, when it should appear a thin jelly; two coats are generally necessary; when applied, the old work should be first washed by a brush with water. This process in old publications is called "painting in water colors." Papered rooms colored in this manner, especially if flock papers were used, look very well, as the pattern can be seen through the coats of colour. A convenience in the use of this preparation is that the rooms may be completed and dry in one day, with very little dirt or inconvenience. It is not generally known that walls which have been distempered cannot afterwards be lime-whited, in consequence of lime when laid on whiting becoming yellow: oil colours, however, can be applied afterwards, and then white lead is used. Apartments that are to be varnished are prepared in two ways. The first is by applying the intended distemper colour, and then covering it with as many coats of coloured or uncoloured varnish as may be required. It may be useful to observe that distemper causes the wood to swell, and that if the material be not quite dry previous to the application of the varnish, the latter penetrates into the size, but is prevented from reaching the wood by the moisture retained in it, which opposes any union with the resins forming the base of the varnish. The varnish then gives to the distemper the hardness of cement, which not yielding to the shrinking of the wood, scales off in drying. The second method is to grind and mix up the colour with varnish, which produces a better result, especially if the coating be applied when the wood-work is dry, and if it be very clear so as to dispose the wood to imbibe it. The successive coats then become incorporated with the first. Generally but little colour is added to the last coat of varnish, and in some cases it may be applied colourless. It then forms glazing, and its brilliancy is greater; the colour also is stronger. The use of size produces a considerable saving of varnish, and the splendour given to this last stratum conceals the imperfections of an unequal coating of the colour. For new plaster work a coat of size is requisite; a solution of glue in water, not too strong, is applied warm that it may penetrate the plaster, which should be already quite dry. Additional effect may also be obtained by a careful pumicing after the first coat.

It is generally asserted that varnish is more liable to injury by dirt than oil paint, and that the means of repairing it cannot be the same, because the dirt adheres more strongly to the resinous parts of the varnish than to the oil surface. Soap and water applied carefully with a sponge, and the use of clean warm woollen cloths to dry the work, are efficacious means of cleaning both surfaces. The steps of wooden staircases which have been painted, grained and varnished, wear better than those which have been only painted; the gloss is only very slightly injured by the operation of cleaning, and neither dust nor dirt adhere so easily. A coat of varnish can be again put on at any time.

The processes of graining and marbling may be traced back as far at least as the time of James VI. of Scotland, (1567-1603) during whose reign a room of Hopetoun Tower was painted in imitation of marble. Before that period, imitations, as I have already mentioned, were done in stone color, marble color, wainscot color, &c. In 1676 marbling was executed, as well as imitations of olive and walnut woods; and in 1688 tortoise shell was copied on battens and mouldings. The friend above referred to, tells me that the doors of the Chapel in Conduit Street, Bond Street, attracted much attention from the novelty of their being grained to imitate wainscot, done, perhaps, about the year 1810 when a new front was given to the building. From some letters in my possession I find that mahogany was imitated in 1815, and maple wood in 1817. The imitating *marbles* and most kind of woods has nothing very peculiar in its mode of execution, being similar to actual painting, the result depending more on *natural taste* than on *mechanical skill.* The process of graining is in the first instance the same as for ordinary painted work, but it requires more care in obliterating the marks of the brush. The last coat, instead of being flatted, is composed of equal portions of oil and spirits of turpentine, and is brought up to the color characteristic of the wood to be imitated. The shades and grain are given by thin glazings of Vandyke brown, burnt sienna or umber, ground in water and mixed with small beer, which is a sufficiently glutinous vehicle, but imitation wainscot requires a thicker one in order to receive the impression of the combs by which the grain is imitated. Thus oak graining is executed with color in turpentine mixed with a little turpentine varnish; the work being covered with it, the combing is done without delay as it dries very quickly. The lights are then taken out with a camel's hair brush, or a rag moistened with turpentine, and rubbed clean. In cheap work the operation ends here, and the surface is covered with copal varnish to protect it; but good work is 'overgrained,' that is, a glaze of color in beer, as dark as may be requisite, is laid over the combed work, in shades thrown across the work. Sometimes the whole panel is laid in with this glaze, and the lights taken out with a sponge; a brush is then used to lighten the edges: when quite dry the work is overgrained with the same color laid on thin and softened off. For graining wainscot in oil, bees wax is used instead of varnish to the color, mixed in equal quantities of turpentine and oil: one, two, or three coats of a good oil varnish, such as copal, are applied when the work is quite dry.

Time only allows me to mention the use of staining and varnishing, and to refer slightly to the process of polishing wood by varnish and wax. Varnish, and polish, both form a glazing, and give a lustre to the wood they cover, as well as heighten the colors of the wood, but from their want of consistence, they yield to any shrinking and swelling, rising in scales or cracking when much knocked about, which damages can only be repaired by application to a proper workman. Waxing, on the contrary, resists percussion, but it does not possess in the same degree as varnish the property of giving lustre to the bodies on which it is applied; any accidents, however, happening to its polish are easily repaired by rubbing. As another method of covering a surface, the board now exhibited has been prepared to show how deal may be employed without the use of oil painting. The surface having been prepared, it was at once grained, the natural colour of the wood forming the ground of the imitation wood, the whole was then varnished as usual. In coarse deal, the knots might be worked into the pattern, but in wood selected for the purpose, the small knots could hardly be said to disfigure the work. Another advantage to be considered of material importance is, that as there is no oil painting required, the material would be drying to the last minute of finishing the house, when the graining and varnishing would be done in a few days.

The proper time to paint is a subject worth consideration. For interior work it is not so important as it is for exterior; though for the former some part of the warm, not hot season, should be selected, not only to get rid of the smell more quickly, but because moderate heat improves the look of the work, while cold air chills the oil. For external work, the proper season is undoubtedly the autumn, when the days are sufficiently hot to dry the work properly, and the weather sufficiently settled to allow of its being carried on continuously. If a house is done up for the summer, the paint then executed in the spring is chilled by the cold and ruined by the unsettled weather. Or should the painting be performed later, say in the months of June or July, the hot sun dries up the oil, the really effective preservative property of the paint, before it can be absorbed. Such work is consequently worthless at the end of less than two years, whereas were it done at a later period the result would be a better appearance, lasting for perhaps double that time. Aspect should also be considered when external painting is required to be performed.

The Chairman (Mr. Scoles, V.P.) in reference to Mr. Wyatt Papworth's remarks on varnishing without painting, stated that the late Sir Anthony Carlisle had the interior wood work of his house in Langham Place, so varnished throughout, and the effect of the varnished deal was very like satin wood. The wood-work of the Swiss Cottage at the Colosseum, in the Regent's Park, was also only varnished.

Mr. C. H. Smith, H.M., said, that in recommending the use of varnish, it was necessary to state what kind should be used. Any resinous substance in combination with an oil would produce a varnish; but the difference between a resin and a gum, which might resemble each other in outside appearance, should be clearly understood. A resin proper would mix with oil, but not with water; whilst a gum proper would mix with water and not with oil. After mixing a resin with any volatile oil, such as alcohol, spirits of wine, or oil of turpentine, and applying it to any substance, the oil would rapidly evaporate, and leave the resin in a powdery state, which could easily be sponged off. Many years ago he had applied mastic varnish to some drawings, but only a small remnant of it now remained, and a sponge would at once expose the surface of the paper. But if used with a less volatile oil, the varnish would produce a totally different effect, and, for wood-work, only copal varnish in oil should be used. This would give a very hard surface, as might be seen on the panels of carriages. Besides Sir A. Carlisle's house, he might mention a house built about the year 1813 at Brighton, by the late Mr. Bonomi for Mr. Prince Hoare, in which the joiners' work was varnished, and it was in a very good condition many years afterwards, the varnish having acquired a very dark rich colour. With regard to cleaning paint, a solution of wood ashes was frequently employed formerly for washing either linen or paint. This mixture, if too strong, had a tendency to decompose the paint, and careless use of pearlash and soda would wash off all the paint, though if used gently it would effect the object required. With regard to paint, the only valuable quality of white lead was its extreme density. In the course of his early experiments he had tried to make a pigment from sulphate of lime, using the finest plaster of Paris; and, although this made a beautiful pigment, there was no body in it. This material was applicable to water colour painting, if mixed with a very little gum to prevent its brushing off. It had advantages over the white generally used for water colours, and made of lead or zinc; and if the slightest film of it were used it would be almost transparent when laid on, but when dry intensely white. In experimenting upon magnesian limestone he had found that magnesia was also applicable as a water colour. He did not know of any sulphate or mixture of sulphur that would have any effect upon it. It was totally unaffected by the vapour from sewers or drains, and therefore superior to white lead for distemper painting.

Mr. J. G. Crace, C.V., said that the best way of treating wood was simply to varnish it, and not to smother it over with paint. Eight or ten years ago he had been employed to paint a house in the Isle of Arran for the present Duke of Hamilton, and he had found the wood work, of red pine, so free from knots, and so well executed, that he suggested that it should be at once varnished. This was done with great success, and the work had lasted, and looked now as well as when it was done. He believed paint had not been used as a preservative to wood before the time of William and Mary; before that time painting was a decorative process. The style of architecture and the use of wood seen in the buildings of William's day, came altogether, he thought, from Holland. Mr. Crace referred to a document in his possession, being a tender for painting the work at Greenwich Hospital in the year 1696, by William Thompson. The price asked for painting outside work three times in oil was 8d. per yard. There was also a price for painting sashes, iron bars, and inside work, and for painting "three times in good linseed oil and well primed." Mr. Crace also referred to papers alluding to the "walnut" and "wainscot" colours mentioned by Mr. Wyatt Papworth. Among these were charges for "all outside painting 3 times in oil, at 8d." and for "all inside, walnut or wainscot, 9d. per yard;" these prices shewed that graining was not intended. At this period (1696, seven years before the accession of Queen Anne,) he believed painting was chiefly executed in white; for in cleaning off the paint from old wood work of that age, he almost invariably found that the original colour had been white. A blue tint was afterwards used, and, in the time of George the Third, various shades of stone colour and drab. Graining and marbling were introduced into this country about the year 1782.

Mr. Crace stated that his father (now far advanced in years) remembered their introduction by French workmen at Carlton House for the Prince of Wales; they were then considered as great novelties, or at all events as a re-introduction. With regard to the operations of painting, he could not too earnestly urge the necessity of careful "knotting," the neglect of which could not afterwards be remedied. The evil arising from this neglect was constantly seen in the common application of two coats of builders' paint, after which the dark spots shewing the forms of the knots soon became visible. For bad work a remedy might be found in rubbing down, sand papering, or pumice stoning; but bad knotting could only be got over by scraping down to the knots themselves, and re-doing the work from the beginning. The use of size color was also to be guarded against, as its application in the first instance prevented the absorption of the oil paints by the wood, and all the after processes only formed a skin laid on the wood work, rather than a coating to effect its preservation. When the sun (as in a window-shutter for example) struck upon wood sized before painting, it was sure to crack and flake off. With regard to pigments, Spanish white was only whiting; none but those with a metallic base had any body at all. White lead furnished the best body that could be applied to wood work. Zinc paint possessed several valuable qualities, but it had very little body. Any one who had used it would know that after even seven or eight coats the grain of the wood could be seen; and he would call particular attention to the fact that zinc paint would not clean well. It had a face which might be compared to wax, and any attempt to clean it seemed to rub in the dirt, so that a bright clear surface could not be got, as with good lead paint. To clean paint he strongly recommended that the raw alkalies should not be used, as they would infallibly take off the flatting coat. The best mode of cleaning was by means of good soap, not too strong, laid on with a large brush, so as to make a lather; this should be washed off clean with a sponge, and wiped dry with a leather. With regard to varnish, nothing but copal should be used, as no other would stand wear so well. It was the most expensive of all varnishes, and therefore could not be applied good in cheap work.

In reply to an enquiry if there was any practical disadvantage in applying zinc paint upon previous coats of lead, Mr. Crace stated that the manufacturers of zinc paint appeared to have come to the opinion, that it was best applied as a finish upon a body of lead. Zinc paint had a good colour, particularly if of fine quality; and under favourable circumstances, would last well. Some experiments which he had tried in a long corridor at the Houses of Parliament, under the direction of Sir C. Barry, where the manufacturers of the zinc paint conducted all the operations, seemed to shew that there was practically no difference in the durability of good white lead and good zinc paint.

Mr. G. Godwin (Fellow), said that the testimonials in favour of zinc paint were very strong, and if it had no other advantage, its prevention of the misery arising in the shape of painter's cholic, loss of hands, &c., from the use of lead, would make every member of the profession anxious to use it. His own limited experience had furnished him with two cases of failure, which he was told had arisen from applying the zinc without cleaning off the coats of lead paint underneath; and the intended white paint had turned out to be nearly black. Mr. Wyatt Papworth's paper had brought many valuable facts together, and would no doubt lead many to understand why one person could do painter's work 30 per cent. cheaper than another, and yet get more money by it. He moved the thanks of the meeting to Mr. Papworth for his paper.

Mr. Ashpitel (Fellow), referred to a large public dining-room in the City, where he had employed zinc white, with a satisfactory result, upon coats of red lead, and found that it was not affected by gas-light as lead paint was.

Mr. Jennings (Fellow), observed that the use of paint had the advantage over ordinary varnish, that besides protecting the work it gave it a harder surface, and enabled it to bear a severer blow than if varnish had been employed. French polish produced the best effect; but if two coats of copal varnish were applied, and then polished, the effect would be as good, and the surface as hard as if the work had been painted.

Mr. THOMSON (Fellow) referred to a case in which a pair of wainscot doors were carefully finished, rubbed down, and hand polished to a satin surface. One side of these was afterwards varnished, and the effect was it bore out upon what was termed the figure of the wood, and it sunk into the softer parts; so that it not only produced a rough appearance but also changed the actual texture of the wood, which, on being touched by the hand, was as coarse as a rasp, and some excellent work was spoilt by the experiment.

Mr. CRACE said, that in the experiments at the Houses of Parliament, to which he had referred, it was clear that the zinc paint had not the marked superiority which was claimed for it. On the sanitary question he added, that the workmen did not like it so well as the lead paint. They said that it smelt sour, and made their throats sore. He had in his establishment men who had worked there more than five-and-thirty years with lead paint, without having a day's illness. He believed it depended entirely upon cleanliness, and among the various artizans employed by him, he would match the painters against any others for healthy-looking men, and steady well-conducted workmen.

Mr. I'ANSON (Fellow) referred to a case in which zinc paint (mixed, he believed, with varnish), had been applied over distemper, and the work had stood remarkably well. His own experience was, that it required five coats of zinc to produce an appearance equal to four coats of lead paint. He found that the workmen nauseated and disliked the use of zinc more than that of lead; but he could not say whether the permanent effects of the latter were most deleterious or not.

The CHAIRMAN referred to the green-houses in the Palace Gardens at Salisbury, which had been painted last year, but the appearance of which had led him to ascertain that zinc paint had been employed, and that the result, he thought, was unfavourable on the score of durability.

Mr. DIGBY WYATT (Hon. Sec.) said, that in any fine revival of the ancient or modern Italian styles of decoration, the effect of the other tints employed depended mainly on the brightness, purity, and durability of the white; and the most beautiful rose tints were obtained through the slightly transparent upper coat of white. In the use of lead paint, or other materials which had a tendency to turn yellow, this important advantage was lost, and it was desirable therefore to consider any material which appeared to possess a character of permanence and purity, with a view to arrive at something like the white pigments which the ancients obtained from their fine white marble.

The vote of thanks to Mr. Wyatt Papworth was carried unanimously, and the meeting adjourned.

MEMOIR OF LOUIS DE ZANTH, ARCHITECT OF THE KING OF WURTEMBURG CHEVALIER OF THE ORDER OF THE CROWN OF WURTEMBURG, HONORARY AND CORRESPONDING MEMBER OF THE ROYAL INSTITUTE OF BRITISH ARCHITECTS, AND CORRESPONDING MEMBER OF THE INSTITUTE OF FRANCE.

By Thomas L. Donaldson, Hon. Sec. of Foreign Correspondence.

Read at the Ordinary Meeting of the Royal Institute of British Architects, November 16th, 1857.

The death of a distinguished brother Architect, and more particularly of one, who has been a Corresponding Member of our body, and a liberal contributor to our collection, demands some notice on our part. I feel it therefore to be a duty, which devolves on me as your Secretary of Foreign Correspondence, to seize as early an opportunity as possible to pay that respect to the memory of our departed colleague, Herr Von Zanth, who has by his works well merited a page in the history of our art.

I have reason to believe that he was born about 1798 at Breslau, in Silesia, and was consequently a Prussian subject. His father was an eminent medical man, and chief physician to Jerome Buonaparte during the residence of that sovereign at Cassel. Louis was educated partly at Cassel and partly at Paris, and it is supposed was a pupil at the Lycée Napoleon. Having evinced a decided taste for drawing he was placed at Stuttgard, where his widowed mother resided, under the architect Fischer, Professor of the Polytechnic School in that town. About 1819 Zanth went to Paris, and became the pupil of Monsieur Hittorff, and although he had then made little progress in composition, he shewed an evident bias for decorative detail and great purity of drawing. He followed his excellent master's advice, and took part in the competitions of the School of Architecture; but being of a reflective and deliberative turn of mind, which cannot at a given moment command the imagination, and hence under such a pressure becomes faltering and undecided, he was never able to improvise with sufficient rapidity, and could not accustom himself to the excitement, bustle and clamor, to which the impressionable youth of our neighbours yield, when engaged in such exercises. This circumstance affected his conceptions, and although his "projets" were drawn out with the most elaborate care, he never could carry off a medal. But when left to himself, and to the quiet of his own leisure and reflection, his designs were admirable, and evinced considerable originality and careful treatment.

Zanth from the pupil became the assistant of his friend and master, and in 1823 both went to Sicily with the view to investigate fully and thoroughly the antiquities of that island, which as yet have never been adequately illustrated, numerous and costly as are the works, and learned as the authors, treating upon its ruins. During their stay, Messrs. Hittorff and Zanth were struck by the beauty of the numerous buildings erected since the Greek times, and which adorn the cities of Messina, Catania, Palermo, and other places, erected by the different conquerors of the island, since it was in the possession of the Romans. They therefore took accurate drawings of the churches, palaces, monasteries, hospitals, public fountains, private houses, as also details of altars, tombs, pulpits, stalls, and other decorative embellishments in the churches, which are marked by a happy freedom of design, novelty, and effective combination. The work, which appeared in the joint names of the authors, was specially edited by Mons. Hittorff, in numbers, between the years 1826-35. The choice of subjects is extremely varied, containing examples of Moresque, Saracenic and Byzantine, as those of Palermo and Mon Reale, and embracing every period of modern architecture without an exclusive adherence to any. The execution of the work is in outline, and may be cited for the judicious selection of the subjects, the purity of the drawing, and exquisite character of the engravings.

At the same time appeared many numbers of their work on the Ancient Monuments. It is to be regretted that this valuable publication has been suspended, from the want of particulars to complete their previous studies, which a personal visit to Sicily can alone satisfactorily supply. It is to be hoped that the survivor may accomplish what still remains a desideratum, a work on Siculo-Grecian architecture, rendered complete by the light of modern researches, and the experience and learning, which have of late years been brought to bear on works of this class, and for the elucidation of which no one has proved himself more competent than Mons. Hittorff.

Zanth was especially struck by the peculiar magnificence of Mon Reale and the Eastern aspect of the Capelia Reale and of the Palaces of La Zisa and La Cuba at Palermo, of which he subsequently made some splendid and elaborate colored views to a large size: and in fact this style of art seems to have had a decided influence on his future artistic taste. In 1830 Zanth quitted Paris to seek a new sphere of employment, and returned to Stuttgard, where he constructed many charming town and country houses, perfectly adapted to the convenience of the occupants, elegant in detail, picturesque in their masses. These erections and some of his beautiful drawings were brought under the notice of the King, who immediately appointed him as his architect, and commissioned him to make drawings for a Theatre to be attached to the Palace; but which unfortunately was never executed.

His Royal Patron was desirous to form for himself a kind of special personal retreat or suburban villa, to which he might occasionally retire for the day or a few hours, like those of the Papal families in the neighbourhood of Rome, as the Villa Papa Giulio, or those at Frascati and Tivoli, or as is found in various parts of Germany; or "*magna componere parvis*," like that at Chiswick, belonging to the Duke of Devonshire. It was to consist of a principal casino, hot houses, and conservatories, porticoes, kiosks, a belvedere, ball-room, theatre, and domestic offices, connected one with the other by the general distribution of the garden, which was to be adorned with parterres, pieces of water and fountains. The Wilhelma is situated at the extremity of the Royal Park of Rosenstein, at a league from Stuttgard and near the town of Cannstadt, famous for its mineral waters, and the gardens extend down to the Necker. The style selected by his Sovereign was the Moresque. The plot of ground appropriated to the Wilhelma lies on a hanging level, rising from the Necker, and Zanth found great difficulty in combining its various parts with the grounds of Rosenstein, which had been laid out by an ignorant gardener, without any reference to the undulations of the surface. In order to make himself acquainted with the most celebrated hot houses in England, he came to this country, and visited those of Chatsworth and others, and also studied the application of iron to the various purposes of the forcing-houses, as also its fitness for the arcades, cupolas, kiosques and columns of the porticoes.

On the occasion of this visit he exhibited his magnificent series of Sicilian drawings in these Rooms, and was elected an Honorary and Corresponding Member of our body. The Studies of the

Wilhelma were commenced about 1838: it was the favorite theme of his future existence, the one great object upon which he employed the remaining years of his life. His time, his health, his talents and his means were all devoted to it; it absorbed all his thoughts and aspirations, he seemed to live for it alone with a chivalrous love for his art. I have said, that the King selected the Moresque Style for the architecture of his Villa; a style, which has not in our days been adopted for an architectural monument of any importance. With the exception of the edifice called the Mosque in the Schwetzingen Gardens near Manheim, no serious attempt has been made to reconcile the forms, combinations and decorations suited for one climate, so as to be adapted for another essentially different. The volume of Owen Jones was the only authentic reference for such a style; but of course it is evident, with even this admirable illustration of Moorish work in the Alhambra, that much must be left to the imagination, the taste and the discretion of the architect, to harmonize the fantastic poetry of the style, its brilliant decorations, and its piquant individuality, with the ordinary wants and conveniences of modern European life. Our friend did not fetter himself by a slavish adherence to precedent, nor neglect any means of success; and he employed stone of various colors from the adjoining quarries for the principal buildings, rich colored brick for the offices, and cast iron for various details. The Wilhelma presents a conscientious mastery of difficulties, and the triumph of the architect was assured, when the most renowned sovereigns of Europe, attended by their numerous brilliant suites, found themselves in the Casino, the conservatories, gardens and porticoes brilliantly illuminated, and reflecting the exquisite decorations, which, harmoniously distributed throughout, charmed the eye and satisfied the taste. And although the magician, who had created the fairy scene, was not there, his master spirit delighted the brilliant circle assembled in this truly royal villa.

Zanth has published ten chromolithographic illustrations of the Wilhelma, drawn with the most elaborate patience, truly German; and they were executed by the most eminent lithographers in Berlin and Paris. He spared no expence to ensure the most brilliant result, and one of the plates, the general view, required twenty stones. The French Government, with a liberality that does honor to its love and patronage of art, subscribed for forty copies; it were to be wished, that our own Government felt more alive to the expediency of encouraging in a like manner publications of this class. He presented a copy of this costly work to our Library.

A wealthy landed proprietor in Hungary sent for him to make the plans for a large village, with houses and farms of different sizes, a church, and other public buildings in connection with the restored castle of the Lord. These designs are of the greatest interest; for he scrupulously studied to make them conform to the materials at command, brick and wood, which were alone procurable in the country: and he gave them a national character, elevated by elegant and appropriate combinations and proportions, without departing from simplicity and utility.

Our friend's health had of late years yielded to the unremitting toil with which he followed his art; and absolute rest being necessary he, last year, visited Italy with Mons. Hittorff and family. His anxious friends had hoped, that he might have enjoyed an elegant repose amidst such scenes without the fatigue of thought, and that the fire of his genius might have been rekindled by the renewed contemplation of the noble works of that classic soil. But the tone of his early energy was gone; the languid invalid looked without emotion at those monuments, which he had once regarded with the liveliest enthusiasm, and his residence of some months at Rome was one of suffering and discomfort. While there he received instructions from his King to design a Protestant Church to be attached to the Royal Palace. This he completed, not without great effort, after the Basilica type, and on his return in June last, presented it to the King, who approved of the conception, and the church was decided to be carried out as designed by him, and to be commenced early in 1858. He had also completed some time since the drawings for a Roman Catholic Church, which it was recently intended to erect after the concordat entered into betwen the King of Wurtemburg and the Pope.

The death of this distinguished architect occurred on the 7th of October last, and was attended by circumstances, which may remind us of the hero cut off on the field of battle, or the chaplet wreath bound round the head of the expiring victor in the Olympic Games. The Emperors of Russia and of the French met as guests at the court of the King of Wurtemburg, and this Prince, wishing to do all honor to the Sovereigns, gave a splendid fête in the Rural Palace of the Wilhelma. The monarchs surprised and delighted with the magnificence and taste of the fairy scene by which they were surrounded, and by a style of art recalling the fabled and gorgeous scenes of the Eastern Caliphs, rather than the court of a German King, eagerly enquired to whose skill and imagination their host was indebted for the exquisite and varied architecture around them. They learned that it was Herr Zanth, and that he lay at that moment on his bed of sickness. The Emperor of Russia, anxious to express his satisfaction to the artist, sent Prince Gortschakoff at once to the bed-side of poor Zanth to present him with the decoration of Commander of the Order of Stanislaus, and the Prince himself attached to the breast of the sick artist the ribbon and cross of the Order, accompanying the act with the gracious and touching expressions of admiration, which the Emperor had uttered. Zanth was on his death bed, but this act of kind consideration soothed the last moments of one, whose devotion to his art and amiable disposition had endeared him to all who knew him.

Zanth was an enthusiastic follower of architecture; his predilections were for classic art. He was unrivalled as a draftsman for the minute accuracy of every part and the finish of every detail. His large perspective drawings were the most scrupulous possible renderings of the buildings they represented; and although they might want somewhat of aerial effect, yet they were always strikingly effective and grandly rendered. He was extremely susceptible in his feelings, and shrinking from observation. In disposition he was most generous, ever ready to acknowledge talent in others, and most firm in his attachment as a friend.

"No man is a prophet in his own Country," and it is to be feared that the noble, upright, and highly gifted architect of the Wilhelma was not as fully appreciated by those immediately near him, as he was by the Sovereigns of other States and by his professional brethren in other countries, who honoured him as an artist and esteemed him as a man. He had received the Cross of S. Gregory the Great from the Pope; that of the Lion of Zahringen from the Great Duke of Baden; that of S. Louis from the Duchess Regent of Parma, and he was Member of the Academies of Berlin, Munich, Milan, &c.

These few notes consist of the impressions produced by an intimate friendship and intercourse of five and twenty years; but I am indebted for many particulars to our mutual friend Monsieur Hittorff, who was to him as a brother, not merely in art but in affection. Zanth was limited in his friendships. His modest and retiring nature made him instinctively avoid numerous attachments; but the few, who knew him, appreciated the rare moral and intellectual qualities, which made them share in the triumph of his successes, and lament him as one whose loss it is not easy to replace.

ON THE ARTS CONNECTED WITH ARCHITECTURE IN TUSCANY.

By J. B. Waring, Associate.

Read at the Ordinary General Meeting of the Royal Institute of British Architects,
November 16th, 1857.

There is no district of Europe entitled to greater respect from all who honour Art, than was that portion of Italy, during the 13th, 14th and 15th centuries, which we now recognize as the Duchy of Tuscany; tested indifferently by the excellence and variety of its monuments, the spirituality of its artists' productions, or the honourable consideration in which their works were held by all ranks of society. This high distinction was in a great degree due to a fortuitous union of elements in the constitution of Florence in the 13th and 14th centuries, such as may never again recur. The favourable position of the city for commercial pursuits, and probably some congenial sympathy on the part of the citizens, early made it the seat of a prosperous trade in, and manufacture of, woollen goods. Its association with the Ghibeline cause nourished aristocratic feelings of veneration for feudal nobility, while the sanctity of the relics with which its earliest religious structures were endowed fostered, more particularly among the democracy, a fervent devotional respect for everything ecclesiastical. Through these three sources, an enlightened oligarchy, a proud nobility, and an ever-active Church, ample patronage was provided for artists; and, as has ever been the case, genius sprang to life in profusion at the all-powerful summons of wealth and honour.

There was however yet one more charm of great potency at work to aid, and which indeed mainly generated, the particular class of excellence to which I propose to draw more special attention this evening:—I allude to that particular veneration for technical excellence, and honest work, which the municipality expressly desired should characterize every work of art for which they gave a commission. Men whose fortunes had been made by the reputation of their skilful weavers, and of their sterling florin,—the only pure gold coin of its time,—could scarcely tolerate in those magnificent structures which were to be the outward and visible emblem to foreigners of their state, either bad work or dishonest material. Handicraftsmen of all kinds were honoured each in their several degrees; guilds and confraternities were erected with special privileges, and the services of all were enlisted to heighten with every external magnificence the pageants of the community, and the monuments of Architecture and its sister arts, which were to be produced for the public enjoyment, and yet more for the public honour. The triumph of the artist was to Florence the triumph of one of its skilful children, whose talent was the manifest source of ease and prosperity to all. Hence the public rejoicings in the "Borgo-Allegro" over the strides made in painting by Cimabue; the public gratulations over the exquisite manipulation of marble work and mosaic by Orcagna in the Or San Michele—over the brilliant ability of Donatello, Ghiberti, and Luca della Robbia, in sculpture, and over the originality of Giotto, and the daring of Brunelleschi in architecture.

The public buildings in those palmy days of art were looked upon as demanding the co-operation of all; and as each man who brought of his best to the work received at the hands of his fellow citizens, both in money and good esteem, the full value of whatever he added to the common stock of beauties, neither the greater men were permitted to appropriate the honours of the less, nor were the less permitted to filch the credit due to the loftier spirits. Hence arose a co-operation among artists and artizans of all kinds such as has been scarcely ever known in the world's history, and hence is derived much of the peculiar excellence and interest of the principal structures time has spared to us upon the almost classic banks of the Arno.

It had been my intention this evening to dwell upon many of the technical arts which contribute to this excellence, but heavy and unexpected engagements have curtailed the time at my disposal, and I have been forced to limit my attention to three of special interest:—viz. Stained Glass, which has not received the attention it deserves at the hands of art students; Painting in fresco, which is so eminently characteristic of all early Italian architecture, and Tuscan in particular; and Marquetry, of which Tuscany appears to have been at least the European nursery.

Amongst all the arts connected with Architecture, there is not perhaps one so capable of imparting splendour to a building as that of Stained or Painted Glass; a fact which appears to have been known and practically applied from the earlier period of the Christian era to within the last century or two. In the first recorded examples nothing more appears to have been attempted than filling in windows with a species of mosaic-work of different coloured pieces of stained glass; nor is it until the eleventh or twelfth century of our era that we have satisfactory records of the application of figure-subjects in this method of decoration,—a system which reached its apogee, with all the other decorative arts, in the fifteenth and sixteenth centuries. There are three methods of executing these glass pictures, which may be termed the Mosaic, the Enamel, and the Mosaic-Enamel. In the first, the composition is formed of small pieces of stained glass, or glass coloured throughout by metallic oxides, termed pot-metal, welded together in small pieces, and producing all the required tints in local colour; the shadows, which are slight, are produced by the application of enamel colour upon them with a brush, and then fixed by burning in a kiln; the best examples of this class are, perhaps, those of the twelfth and thirteenth centuries. In the second, or Enamel method, which was most in vogue during the sixteenth and seventeenth centuries, the artist painted his subject entirely with enamel colours on a ground of white glass, sometimes on one side only, sometimes on both; the entire design being welded together in pieces of much larger size than those usual in the Mosaic method; and, when complete, fixed by exposure to heat in a kiln. In the third, or Mosaic-Enamel method, we find a combination of both the former: it was most in vogue, as might naturally be supposed, at a transitional period between the first and second methods, and is indeed characteristic of the works of the fifteenth and of the early part of the sixteenth century. In this method, the use of pot-metal for the large masses of colour imparts all that brilliancy and power which is peculiar to the material; whilst the use of enamel colour for the more delicate portions of the picture, as the flesh, the hair, the ornaments, and the general accessories, permits a delicacy and minuteness of finish otherwise unattainable. The drawings now exhibited are principally illustrative of this method of glass painting. In these it will immediately be seen that the figures are all-important, and that the ornamental portions are merely accessories. It may here be well to notice some of the objections made against this practice of paintings or pictures on glass. "The first (according to Mr. Winston,* who has paid great attention to the art) being the supposed unfitness of the material for any sort of representation more pictorial than the mosaics of the twelfth and thirteenth centuries; the second, the supposed impropriety of representing a receding picture on the wall of any building: in support of the first ground of objection, we are told that a glass painting reverses the conditions of Nature, by making the lights transparent and the shadows opaque; that the violence of its colouring is wholly opposed to pictorial effect; and to bound objects with black lines, is reprehensible on every artistic consideration. The first of these arguments is at once disposed of by the observation that we have nothing to do with anything but the *effect* of a glass painting; and that when the material is, like that of the cinque-cento period, of a horn-like texture, the high lights do *not* appear to be less solid than the shadows. . . . The remaining objection, that it is wrong to represent a receding picture on the wall of a building, and consequently in a window, the glazed surface of which is but a continuance of that wall, seems to rest less on a consideration of facts, or the dictates of our external senses, than on a sort of mock philosophy, which seeks to escape laborious investigation by the enunciation of a 'principle;' than which, by the way, nothing is more easy. It may be conceded, that to carry a receding picture all round a room produces an ill effect; but pictures, though representing the effect of depth and distance even almost to illusion, are admitted to be allowable, provided they occupy only a portion of the wall, either by being hung against it in a frame, or by being actually painted upon it,—the latter sort indeed can plead the testimony of ages in its favour. If, then, a glass painting should have the illusion of distance, it would be unobjectionable, because, necessarily, it would occupy only part of the side of the room or building containing it. And as we are accustomed to see out of a building by looking through its windows, those who mistook the painting for a real object, might easily stretch the imagination a little further, and conclude that it was some object placed outside the building, until its unreality became apparent, from the figures continuing to remain motionless.. . . . It might indeed sometimes happen, that, for the sake of preserving distinctness at a very great distance, a glass painting in which figures were represented on a flat ground, would be preferable to one having a receding background; but I think that the glass-painter need be deterred by no other consideration from employing a receding background, if he thought proper. Indeed, a glass painting having a sky or landscape background, such as we meet with in good cinque-cento examples in general, would be peculiarly suitable for a window at the end of a building, on account of the retiring nature of most of its hues. I conclude therefore that, in the preparation of painted windows for classical edifices, the artist has the choice of a more or less severe style of representation, to be used according to the character of the building he is required to decorate; and that the type of the one style is to be found in the remains of the twelfth and thirteenth centuries' mosaics, and the type of the other is to be found in the glass paintings of the second-quarter of the sixteenth century." In these remarks I heartily concur, only substituting for the second type, the works of the close of the fifteenth and the earlier years of the sixteenth century in place of the second quarter of the sixteenth century, at any rate as regards examples existing in central Italy.

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* "On the Application of Painted Glass to Buildings in Various Styles of Architecture."

The deep and brilliant tones, the fine drawing, the simplicity, and the solidity of the examples of the fifteenth century in Tuscany, resembling in character the best productions of the early Venetian painters, gave place to works of a more ambitious but a more flimsy nature; and we perceive in the first quarter of the sixteenth century a complete divergence of style in the great windows of the Cathedral of Arezzo, executed by William de Marsiglia, or Marcilla, in the year 1523. The qualities alluded to in the fifteenth-century subjects are lost; and the praise of Vasari, who describes them as something rained down from heaven as a consolation to mankind, is certainly due rather to the Florentine and Lucchese examples, than to these somewhat flimsy and straggling compositions: but Vasari was an Aretine. About this period also works in *grisaille* became very frequent. These are painted with enamel monochrome, on a white field; and, though very ineffective, are pleasing, from the fancy and skill exhibited in their execution. Such are the windows of the Laurentian Library at Florence, designed, if not executed, by Raffaelle's favorite pupil, Giovanni da Udine, about the year 1540. Contemporary with this fashion, a richly-coloured system of glass painting, by Swiss and

German artists, was much in vogue; generally on a much smaller scale than that hitherto practised, being chiefly used in civic and private residences. At the end of the fifteenth and during the sixteenth century, and even later, Nuremberg, Ulm, and Freyburg, in Breisgau, were especially famous for works in this style; but this last flitting gleam of departing splendour, had, by the eighteenth century, nearly died out, and from that period glass painting, in common with all the decorative arts, as applied to Architecture, fell into desuetude and decay.

In the revival of this art during the present century, the artists of France, Italy, Belgium, and Germany have taken the lead, and far surpass any efforts made by the English; yet in the best of these there is much that is unsatisfactory, and neither in drawing, colour, nor solidity, do they bear any comparison with the best works of the fifteenth and sixteenth centuries in Tuscany. This arises principally from an insufficient adoption of pot-metal in the masses of colour, the false idea that the numerous lead lines of the small pieces of glass in the mosaic method are antagonistic to the general effect,—the contrary, I believe, being certainly the case,—the insufficient use of large masses of shadow, and too minute attention to blending the several local colours: such were the defects which struck me in the otherwise beautiful works of Capronnier of Brussels and of Bertini of Milan, in the Great Exhibition of 1851, and in those of Petit Gerard of Strasburg, of Lafaye, Gérante, and Lusson of Paris, and of Vincent Larcher of Troyes, in the Paris Exhibition of 1855.

The notices of the magnificent stained glass windows of the Duomo of Florence are very meagre; some of them are merely stated to have been executed in 1434 by a Florentine artist, Domenico Livi da Gambassi, at Florence, who had learnt the art at Lubeck. This may apply to the series of which an example is given, though that even appears improbable, and some of the subjects in the upper windows of the transepts, of which St. James is an example, are certainly of much earlier date. The entire series is remarkably rich in colour, and consists of the prophets and kings of the Old Testament, and the Apostles and Saints clad in most picturesque and striking costumes, such as Freiligrath describes in his "Pictorial Bible," presenting a fine example of those "storied windows richly dight" which Milton has celebrated in verse.

They are formed of small and irregular pieces of stained glass, and in the *ensemble* present no extreme delicacy of execution nor peculiar depth of shadow; the effect being obtained by a rich combination of colours, excellently arranged, and very much in accordance with the scientific principles enunciated by M. Chevreul: the robes are seldom of one plain tint, but are richly worked with ornamental patterns of a bold and effective character. The faces and drapery are seldom strongly marked in shadow; and the former, though in some cases, as in Moses and the king, very finely expressed, yet in others, as in St. Simplicius, are very rudely formed,—a defect however not easily remarked at the distance they are placed from the eye, whilst the object which the artist evidently sought, namely a rich combination of colour, is perfectly obtained. The dark leaden lines with which the small pieces of glass are welded together, without any regard as to where they occur, are also lost in the distance; while the important result is produced by means of these black lines, that much greater solidity and a much stronger effect of colour are obtained. They give increased contrast and distinctness to the separate colours and to the entire composition, which, if not treated in this manner, is apt to become confused and flimsy-looking even at a short distance: indeed it may be taken as a general axiom, that the blending of tints, unless in subjects very close to the eye, should be avoided in stained glass as simply labour thrown away.

All the figures of the series are nobly designed and full of character. They are represented standing or seated beneath niches or recesses, shown in perspective, inlaid with various-coloured marble in panels, at the back of which is shown a deep blue sky. Many of the inscriptions are formed of yellow letters on a black ground, and the ornamental borders, of simple and effective design, are remarkable for their resemblance to those executed during the thirteenth century in England.

The painted windows of the choir of S. M. Novella, at Florence, are amongst the most remarkable and effective examples to be found in the Renaissance style: they are stated to have been executed by Alessandro Fiorentino in the year 1491.

The triple window of the choir, each side-light of which contains three figures of saints in niches placed one over the other, surmounted at the top by a dome, presents a mass of powerful and brilliant colour, an excellence of design and execution, and a breadth of light and shade, such as can seldom be met with; and when the setting sun throws its rays full on this window, nothing more wonderfully gorgeous can be conceived. It is then we arrive at the conviction that it is only by painting on glass, that the colourist can hope to obtain effects to vie with the most beautiful tints of Nature, as seen on birds, insects, shells, jewels; in comparison with which the greatest efforts of the Venetian and Dutch schools, of Delacroix or of Etty, appear dull and lifeless: this may be accounted for by supposing, that in the case of an oil painting, the image is impressed on the retina of the eye by reflected light, whilst in that of a window the object is cast on it by direct rays.

In these windows the designs are still composed of irregular pieces of glass, without any regard as to where the lead lines may occur, except in the faces, and even then, occasionally the artist was not very particular. The pieces of glass are however generally of larger size than those in the Duomo. There are very few portions left perfectly white, and the lightest coloured are always of a warm cream or light straw tint, the shadowed portions hatched in with rich brown bistre lines: the skin is generally of a rich, somewhat red, siena tint, with warm brown shadows; and all the latter are strongly marked, especially in the draperies; indeed the whole system employed reminds us of the great school of early Venetian colourists, represented by Cima da Conegliano, Marco Basaiti, and Carpaccio.

The features, extremities, and anatomy (when seen) are excellently drawn; the faces of the men are characterized by a manly nobility of expression, and those of the women by much sweetness and grace. The artist has felt himself at liberty to apply colour arbitrarily to the architectural accessories: there is little attempt to be matter-of-fact in these aerial buildings, which glitter with all the splendour of works composed of the most precious stones and jewels; and when masses of colour occur, they are generally rendered luminous by small bright dots on a darker ground of the same tint. In the draperies we observe two particular kinds; the one black, which, lightened by some pattern, such as white stars, becomes of essential service as a key and a contrast to the brighter colours; the other, dark purple, which is of incomparable beauty. As I have already noticed in all the former examples, the lead lines serve to give distinctness and force to the whole design.

The borders of these windows are boldly designed and very effective, and plainly shew how much labour is frequently wasted in the minute ornament too often seen in modern stained glass.

Central Italy is rich in similar works, and it appears extraordinary that more attention has not been given to them. Amongst these may be more particularly mentioned, at Florence, the very rich early Florentine Gothic windows of Or San Michele; the Gothic windows of the aisles in Santa Croce; several windows in the Duomo, said to be executed from the designs of Ghiberti and Donatello; the great circular window (the Descent from the Cross) by Ghiberti, in Santa Croce; and the circular window of Santo Spirito; at Lucca, the cathedral, and the church of San Giovanni; at Siena, the great circular window of the cathedral, designed by Pierino del Vaga, and executed by Pastorino of Siena in 1549, and some good pieces in the church of Fonte Giusta; at Pisa, in the Duomo, rich in colour, but confused in design; at Prato, in the cathedral, somewhat coarse and crude; the large windows of the cathedral at Arezzo (sixteenth century), and the lancet windows of the choir of much earlier date; a circular window in S. Francesco, and some excellent examples in Sta. Annunziata; the very fine Gothic window of the choir of San Domenico, at Perugia; and the entire series of windows in the lower and upper church of S. Francesco, at Assisi, principally of the fourteenth century, —works of a remarkably ornamental character.

Proceeding now to Fresco as an ornamental adjunct to architecture, we find that between the Byzantine epoch, when mural decoration could boast of the rich and solemn effect produced by the use of mosaic inlay, and the revival of the art of painting in the fifteenth century, there extends a long period, embracing the works of the Romanesque and Gothic styles, neither of which has been illustrated in the manner they deserve; an omission arising chiefly from the few remains which exist at this day in a perfect state, at least in the Cisalpine countries. As regards the first-named style, we have frequent records that painting was extensively applied as an internal decoration, where mosaic-work could not be obtained; and we constantly find notices, during the eleventh and twelfth centuries, of the walls of churches being covered with painted subjects, illustrating the Sacred Writings or the lives of particular Saints.

Amongst the names which preceded Cimabue in this art, that of Giunta da Pisa stands foremost; and I would mention the church of San Piero, in Grado, as one of the best-preserved and most complete examples of his epoch, if not of his style, which is now in existence. Cimabue (1240—1300) formed a style transitional in its character, which still retained most of the conventional dispositions of mural decoration and figure drawing, on which however is grafted a return to natural models; but to Giotto (1276—1336) is due the complete formation of a new school, in which the study of Nature, and a certain development of the antique Roman style, preponderate over the conventionalities of the Byzantine school. From this period may be dated the true revival of the art of painting (principally in fresco) in Italy; in the advancement of which stand prominently forward the names of his contemporaries, pupils, and followers, such as Simone Memmi of Siena (1276—1344), Taddeo Gaddi of Florence (1300—1352), Spinello Aretino of Arezzo (1308—1400).

The general characteristics of this Italian Gothic, or Giottesque style of mural decoration are,—a dado, or base, panelled with imitations of various marbles, contained within borders painted in imitation of the glass mosaic-work usually known as Opus Grecanicum, having at times central designs of intricate geometrical and leaf ornament. About six feet from the floor is a cornice with small brackets or consoles, all radiating in perspective to a central point of sight: above this the wall is divided into large compartments, containing historical or religious figure subjects, the figures being strongly outlined, and the colours flat and distinct, with but a slight use of chiaro-oscuro; these compartments are also enclosed in painted mosaic borders, and beneath each there is a description of the subject illustrated, written in peculiar Gothic letters of a very good style. The vaulting of the roof springs immediately from above these pictures, the only actual projection being one large central rib, ornamented with winding foliage and mosaic borders, and painted mouldings to carry it more agreeably on to the flat surface of the vaulted compartments, which are almost always painted of a deep blue, studded with gold stars, and in the centre of each of which are painted figures, usually holding written scrolls descriptive of their meaning. Sometimes the names are written on the clouds beneath, from which they frequently appear to rise. The intersection of the rib is marked by a gold boss, carved and gilt, but not of great size, having a ring in the centre, from which a lamp was suspended. The ornament is generally a mixture of mosaic-work, Roman reminiscences, especially in the painted mouldings, and transcripts from Nature; the two first however being predominant. The colours are well arranged, and the ornamental accessories, such as dresses, buildings, thrones, armours, etc., are of great variety and beauty, and very carefully executed.

Such are the general characteristics of most of the mural decoration in vogue up to the close of the fifteenth century, as seen in the works of Orgagna at Pisa and Volterra, of the Lorenzetti and Bartoli at Siena, and in the several Italian schools of Italy. And although the works of Paolo Uccello, Masaccio, Ghirlandaio, and Signorelli present many points of divergence, the principal feature being the greater importance attached to the historical subjects and a very superior style of execution, yet it is not until the time of Perugino that we find a completely different system adopted; and to him appears to be certainly due the introduction of a style in every way superior, which was extended and improved by his contemporaries and pupils, amongst whom Pinturicchio and Raffaelle are most prominent.

I will now bring under your notice the last division of my subject, which is the art of Marquetry, or inlay in wood. Although a passage in the treatise of Theophilus on Painting (twelfth century) appears to bear on the practice of working in several kinds of wood,—"cupri, ferri, *lignorum*, lapidumque,"—yet the earliest examples with which we are acquainted are to be found on the ivory boxes, ornamented with inlay of various-coloured wood, chiefly manufactured at Venice during the fourteenth century. In these the art was only employed as an adjunct; and it is not until the close of the fourteenth or the commencement of the fifteenth century that we find it applied as an ornamental art by itself, and developed on large surfaces. Vasari and Lanzi state, that Brunelleschi gave lessons in perspective and tarsia, to architects and others, of which Masaccio, in painting, and Benedetto da Maiano, in his inlaid works, availed themselves. Vasari says that several works of the kind were executed by the old masters, "da nostri vecchi," and were termed by them works in "tarsia," or intarsiatura. In his life of Benedetto da Maiano, he states that this practice was first introduced in the time of Brunelleschi and Paolo Uccello, "that, namely, of conjoining woods, tinted of different colours, and representing with these, buildings in perspective, foliage and various fantasies of different kinds." The earliest artist in this manner mentioned by Vasari, is Giuliano da Maiano (1432—1490), architect and sculptor, who commenced his artistic life with works in *tarsia*, and executed, as his first work, the seats and presses of the sacristy in the Church of the Annunziata at Florence, with Giusto and Minore, two masters of tarsia. Other works of his are mentioned by Vasari, in the abbey church, Fiesole, and San Marco, Florence. Giuliano, on his employment as architect, left tarsia-work to his brother Benedetto, who became a celebrated artist in that style. Some of the presses in the sacristy of the cathedral of Florence are by him: and especial mention should be made of the door of the audience chamber in the Palazzo Vecchio, executed by him or by Giuliano, representing Dante and Petrarch in ornamental borders, etc., on each leaf of the door. Other artists in this style, mentioned by Vasari, are Baccio Albini and his pupil Girolamo della Cecca, pipers to the Signoria, who worked also in ivory, when Benedetto was yet a young man; David of Pistoia, and Geri of Arezzo, who decorated the choir and pulpit of Sant' Agostino in that town; Giusto and Minore, his assistants, and Guido del Servellino and Domenico di Mariotto, his pupils, in the Duomo of Pisa, all of whom belong to the fifteenth century. Lorenzo Canozio da Lendinara, a fellow-student of Mantegna, who died about the year 1477, is stated in his epitaph to have inlaid the choir of Sant' Antonio at Padua with tarsia-work. One of the greatest names in the art, however, is that of Fra Giovanni da Verona (sixteenth century), who, according to Vasari, in place of the dark and light woods of two or three tints used by the Maiani and their followers, gave artificial colours to his wood inlay "by means of waters, coloured infusions, and penetrating oils: to obtain brilliant high lights he was accustomed to use delicate slips of willow." F. Vincenzo dalle Vacche is mentioned by Morelli in his "Notizia," as excellent in such work, particularly in the church of San Benedetto Novello at Padua. Fra Raffaello da Brescia, of

Monte Oliveto, ornamented the choir of San Michele in Bosco at Bologna. Sabba Castiglione, in his *"Ricordi, ovvero Ammaestramenti" (Venezia, 1562), mentions the Legnaghi as good artists; and the Dominican monk, Fra Damiano da Bergamo, as the most celebrated of the sixteenth century "tarsiatoii." The varied colouring was produced by chemical fluids and oils, with the aid of shadows burnt-in; but Fra Damiano's best works, in which he was assisted by Fra Antonio Asinelli, are not in colours, but the effect is aided by burnt shadows. Other works of his mentioned by Lanzi, are in the Dominician church at Bergamo, and in San Pietro dei Casinensi, Perugia. Gian Francesco Capo di Ferro, is spoken of as working also at Bergamo. Other fine works are to be seen in the choir of the Certosa, at Pavia, by Bartolommeo da Pola, in 1486; in the choir of the cathedral at Siena, by Fra Giovanni da Verona; in the sacristies of San Miniato al Monte and Santa Croce, at Florence; and in the Sala del Cambio, at Perugia, signed with the name of Marc Antonio Mercatelli. The tarsia-work of artificially-coloured woods, which Sabba Castiglione eulogizes, is not to be found in any of the above named works; and although the practice clearly originated in Italy, it was brought to perfection subsequently in France and Flanders. But the art was in an abnormal condition. The just principles of wood-mosaic, for it is nothing more, transgressed by the Italian artists, spread to a ruinous extent: and thus, in combination with the wretched state into which all the decorative arts fell during the eigthteenth century, it gradually died out,—although some fair examples, in two colours only, on articles of furniture, are to be found up to a late period. The art is now revived and practised to some extent, for purely decorative purposes, on furniture. But I am not aware that any advantage is taken of its effect by architects, which those who have admired it in some of the subjects cited above will regret; for it is every way commendable, so long as it is confined to a mosaic of different coloured woods (as in the best examples of the Italian school), without attempts at pictorial effect.

The stalls of the chapel attached to the Palazzo della Signoria at Siena are richly inlaid with marquetry, consisting of allegorical and scriptural figures, surrounded with ornamental borders. They have been ascribed to Taddeo Bartoli (who painted the walls of the chapel in the year 1414), but they would appear rather to belong to the fourteenth century, although it is possible that he may, at an earlier period than 1414, have given some of the designs for the allegorieal figures, etc. The central carving, of Romulus and Remus suckled by the wolf, was the "enseigne" of the city of Siena, and beneath, at each angle, is the heraldic shield of the Republic. The central subject of the lower portion represents one of those wheels of fortune so frequently met with in all kinds of material throughout the Mediæval and Renaissance periods. The figures on this probably have a political meaning.

The stalls in the choir of the Duomo at Pisa contain two distinct kinds of subjects in wood inlay; one, a series of Saints, the other, subjects from inanimate nature, flowers, musical instruments, &c. I could find no local information as to the period of their execution, or the names of the artists; they appear however to belong to the early part of the fifteenth century. The busts of St. Paul and St. Andrew, give a fair idea of the quaintness and vigour of design which characterize the entire series. Vasari says that Giuliano da Maiano ornamented the seats of the priest, deacon, and subdeacon, before the high altar of Pisa cathedral, with intarsiatura, and that whilst working there employed Guido del Servellino and Maestro Domenico di Mariotto, joiners of Pisa, to assist him, whom he so effectually instructed in the art, that they afterwards finished the greater part of the remainder; the final completion however was due to the Pisan, Battista del Cervelliera, who executed them, according to Vasari, in a much better manner.

The stalls of the choir in the upper church of Assisi, about one hundred in number, were orna-

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* See Digby Wyatt's "Industrial Arts of the Nineteenth Century," and Report to the Board of Trade on "Furniture and Decoration."

mented, at the close of the fifteenth century, with a very fine series of ornamental marquetry subjects, by a monk of the monastery, Fra Domenico di San Severino. In these the graduated tints appear to have been effected by means of burning, and the use of hatched or engraved lines on the light-coloured wood is carried to a greater extent than is usually found in the process of wood inlay.

The moral that may be deduced from the few observations offered this evening on some out of the many arts associated in the production of the great monuments of Tuscany, is the following:—it has been the great misfortune of Architecture, from the last century up to the present time, to be considered as a study *per se;* as an art perfect in itself, and requiring no adventitious aid from the sister arts of Sculpture, Painting, etc.; but if we search antiquity through, we shall find no example of such a disconnection of the one from the others; and those buildings are the most interesting, the most beautiful and satisfactory, which have sought the aid and guided the aim of all those varied and ingenious methods of ornament, which the skill of mankind has discovered and brought to perfection. It is true that constructive science is of primary importance to the architect; yet it can do no more than form the skeleton which it is his duty to render, not merely useful, but agreeable to the eye; and in order to effect this, he must of necessity call in the aid of the artist in stone, in colour, in metal, in wood and mosaic work, and possess the knowledge and good taste requisite to apply them effectively to his subject; the useful should never be separated from the beautiful; the last is the complement of the first, of which every work of the Divine Creator, the great Architect and Artist of the Universe, affords striking and inimitable proof.

To one deeply penetrated with this feeling, the study of Architecture is no longer confined to the few years spent in an office to obtain a knowledge of the different styles, and the usual methods of professional business, but demands long-continued attention to all the arts of Design, with a view to their general application to Architecture. And here let me say a word on the subject of servile imitation, an evil almost necessarily attendant on the revival of any style or manipulative art. Novelty and beauty excite admiration, and naturally produce imitation; but this will be only for a time; for we should not be human beings if finally we did not endeavour to strike out a new path for ourselves; and then it is that we shall bring to bear our knowledge, not for the purposes of imitation, but of progress. With all just deference to the studies of our predecessors, with all our admiration for the styles of the past, our present object should be to consolidate and arrange the information we now have; and from the lessons thus gained, the examples thus given, strike out a new path for the powers of the Architect, and bring back the art to its normal state, which is one of gradual but sure progress, founded on scientific and artistic knowledge: we should perceive that merit exists more or less in all styles, and is irrespective of fashion, which is mutable and often unjust; that the *principles* of our art are fixed and certain; that however much long-received rules may be altered as circumstances may require, they are not to be despised or disregarded without careful consideration; that true construction is the vital principle of real progress; and that, besides the excellent and numerous examples of ornament we already possess, Nature has still varied and inexhaustible resources in store for our study; and above all, that for the appliance of these means at our disposal, an earnest study, a just appreciation, a practical knowledge of *all* Art, are indispensably necessary, and can only be obtained by an industrious use of the hand and of the eye, as well as of the mind.

But to what purpose should we do this? What incentive has the architect of this country, and this day, to undergo an education of so protracted and so difficult a nature? Let it be owned at once, that the artist's own improvement, and the development of his own powers, with the personal pleasure consequent thereon, must be the only reward he can reasonably look forward to. Such studies for an architect are "as caviare to the public," that public which requires builders not artists, and looks with jealousy and distrust on any architect who thinks more of his profession as an art, than as a trade: How differently was the architect of the 15th and 16th centuries in Italy situated! In Tuscany especially, that classic home of art where the old Etruscan spirit, though dormant for centuries, rose from its temporary grave in all the glory and majesty of a bright resurrection, the appreciation and admiration of the public were not confined to one art or to one set of men, but to every thing which was calculated to lend a grace and charm to all the requirements of civilized life. The church, the government, the municipality, the noble, the wealthy merchant, delighted to honour all that related to the arts, and the artist might labour contentedly at his own improvement with the certain assurance, that the better he succeeded, the wider and deeper his studies were, in that same measure he might count on the applause and appreciation of his fellow citizens. After all to the generous mind, what reward in money, what payment, however great it may be for services as a man employed to do a certain work, as a servant in fact, can compensate for the want of appreciation as an artist? but not for this let us falter or be cast down, the good work must still go on, and though the task be a thankless one, though the seed be cast on a stony and rough soil, yet it is necessary to proceed, trusting that in the future such studies will bear fruit, and be of service to our country. It was this variety and catholicity of study which invested the architects of Mediæval Tuscany with so much glory and romance; with them architecture was regarded in its just light as the leader and employer of all the arts, which were pressed wisely and with great success into its service, and the examples which we have before us this evening, serve, but in a very slight and partial manner, to afford some idea of the richness and beauty of Italian architecture, whether of the Mediæval or Renaissance periods, and show how like a beautiful garden of delight was that architecture, in which, not only the noblest trees of the forest were allowed to spread their umbrageous foliage, but in which bloomed with fragrant scent, every plant and flower that could be culled from the wide field of Nature.

Mr. Donaldson (H.S.F.C.) said there could not be in all Europe a more striking example of the want of all those adjuncts of art so ably described by Mr. Waring, and which were necessary to form a complete picture, than St. Paul's Cathedral. Mr. Waring had observed that the useful should never be separated from the beautiful; and the converse proposition was equally true; indeed beauty was necessary to give expression to utility, and to bring it home to the mind and the feelings. Viewed externally St. Paul's was a building of considerable size and harmonious proportions, but no one could look at the interior without feeling a chilling effect, from the want of a combination of the subsidiary arts necessary to render it impressive. If this edifice had been completed with stained glass windows, and with frescoes on its walls, its effect, as the most glorious work, abstractedly considered, of the greatest architect of this country, would be to impress every one with far different feelings. The poor and niggardly works of this country afforded a strong contrast to such buildings as the Church of St. Vincent de Paul at Paris, which had cost from £90,000. to £100,000. That was indeed a work worthy of the nation. The windows were all beautifully painted, and each of them formed a part of the architectural whole, whereas in buildings in this country the wall was merely cut up by holes for light, letting in all the blaze of day. The Church of S. Gudule at Brussels was another example: in the windows of which there was a series of exquisite cinque cento pictures. These however were discordant with the style; but in St. Paul's such pictures would harmoniously produce the desired impression. Objections might be urged against receding pictures on walls, and to a certain degree, correctly. In a church at Lille the end wall of the aisle was painted in perspective, by which the aisle seemed at first sight to be prolonged, and from a proper point of view, with a happy effect; but on approaching nearer it was unsatisfactory. It was necessary that many branches of art should be employed to carry out perfectly the ideas of the architect; who should not restrict himself to stone, and to geometrical lines, but rather avail himself of all the accompaniments so ably alluded to by Mr. Waring. Mr. Waring's logical treatment of the question was particularly happy, beginning as he did with an analysis of the beautiful and the interesting, and its application to its legitimate purpose; shewing that he did not look at a building abstractedly, but with reference to the effect produced on the mind of the beholder. In modern Gothic architecture many of the elements of beauty under consideration had been introduced, but from some hesitation in the public mind it had not been prepared to receive a like amount of decoration in classic and Italian buildings; but there could be no doubt that if they had the wish to do so, they had the power, to introduce all the effects and all the advantages of the accessories which Mr. Waring had described.

Mr. Fraser (C.V.) referred to the engraving published one hundred years ago, shewing the decorations intended for the interior of St. Paul's, as a proof that it was the intention of Sir C. Wren to have had it richly decorated. Owing however to parsimony on the one hand, and puritanism on the other, these decorations had not been carried out.

Mr. Digby Wyatt (H.S.) said it was but justice to Sir C. Wren to remark that about the best wood carving and iron-work in London were to be found in St. Paul's.

Mr. Donaldson observed that the engraving referred to did not emanate from Sir C. Wren. The decorations were inserted to shew what should be introduced, but he did not think they were designed by Wren. The plate was not published till 1755, many years after his death.

Mr. C. Barry, Fellow, remarked that every one interested in art, and especially architects, must feel how very difficult it was to have the whole of their ideas harmoniously carried out. This difficulty arose not only from disputed questions of taste, but from the still more unfortunate fact that nothing good or beautiful could be done without expense. He quite agreed with the remarks upon St. Paul's Cathedral. It should be remembered that the national purse could do what private ones could not, and it was a duty incumbent upon the nation to shew what it could do in this respect.

The motion of thanks to Mr. Waring for his paper was unanimously carried, and the Meeting adjourned.

ON THE FOUNDATIONS OF SOME OF THE METROPOLITAN BRIDGES IN THE RIVER THAMES.

By W. A. Boulnois, Associate.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, November 30th, 1857.

Various circumstances contribute to the interest which the subject of the Foundations of the Metropolitan Bridges has lately excited. The failure of Westminster and Blackfriars bridges—the various causes to which different eminent engineers have attributed these failures—the difference of opinion which exists as to the employment of compound constructions in works intended for permanence, and the interference of the Board of Public Works when the Chief Commissioner desired to be satisfied of the efficacy of the schemes which had been matured under his predecessors and sanctioned by the Committee of the House of Commons—the reports in the public papers of the dangerous condition of two of the bridges which span the Thames—the formidable stagings and centerings which were encountered by the river steam-boat passengers—the visible cracks, not to say fissures, in large masses of stone masonry, which had hitherto been to the ordinary gazer the very embodiment of strength and stability;—all have contributed to make the London world more than usually acquainted both with the nature of the requirements in any new bridges, and of the means by which those requirements were to be best effected. But we as architects and engineers need not go into the polemical discussion of these affairs, and our interest is sufficiently aroused by the great advances which have been made in nearly all methods of construction, within the last quarter of a century, by the numerous examples of new systems of foundations scattered all over the country in railway bridges, wharf walls, dock entrances, and other works in water, and by the experiences of the French, German, and Dutch engineers, which are for the most part so admirably described in their elaborate publications which reach us, and are accessible to all of us through our association with this and the kindred Institution in Great George Street. Most fortunate has it been for architects and engineers, that the old bridges have been propped up so long, and that new ones have not replaced them, because the experience which has been gained within the last fifteen years by their failures and the remedies applied to them, far exceeds in value the cost of the props and the inconvenience sustained by the inhabitants of the town during their passage either over or under the bridges. The only cause for regret indeed is the immense waste which was occasioned by the fruitless efforts to overcome what a scientific examination into the matter would, I cannot but think, have proved to have been irremediable.

I propose to describe first the foundation of the bridges in the order of their dates of construction. They are probably, at least those of old Westminster and London Bridges, well known to you; but it is very desirable that, at the risk of some tedium, the premises for what I hope will lead to a discussion of the subject, should be laid down.

Westminster Bridge was constructed by Labelye in 1738 to 1747; it consists of thirteen semicircular arches, in Portland stone, the centre arch being 75 feet span, and its piers being 28 feet wide at the bottom of the footings, the arches decreasing in each span towards the sides, which are 54 feet span, and the piers decreasing each 1 foot. The foundations were laid in caissons; it is supposed that no piles were used at all, but from an old account which I have met with, I am inclined to believe that some few piles were driven down into loose ground, which was found under the third pier from the Surrey shore. These piles were, I presume, rammed down below the level of the ground, because there is no evidence of the practice of sawing off piles below water being pursued at that time. The caissons were flat-bottomed vessels with vertical sides, which were so constructed as to be removable and to serve for new bottoms. They were constructed on a launching stage, and after the seams and joints had been caulked they were floated into the river and moored over their intended sites, to guide piles and to chain moorings. The holes which they were to occupy in the river had been dredged out and made level, but on the first occasion of sinking the first caisson, which was done by letting in the water through a sluice after the first course of the foundations in stone had been laid in the vessel, it was found that the levelling (Labelye calls it "digging,") had not continued level, and that some ground at the sides had fallen in. The hole, or "pit," as it is termed by Labelye, was about 6 feet deep and 5 feet wider than the caisson all round, and sloped off at the sides. The water was thereupon pumped out and the caisson rose, the defective bottom was redredged, and the caisson was sunk a second time, when it bedded itself perfectly level.

The caissons were 80 feet long and the widest about 30 feet wide, they were of fir, the bottoms were framed, and they rested on sole pieces, as we should term them, which projected below the bottom level of the framing about 6 or 8 inches. I imagine it was presumed that this sole piece would cut itself a channel, but it would seem it did not always do so, for in a part of the old caisson bottom which has been taken up and is now on the stage at the Westminster Bridge works, the cross bearers have considerably sunk, and indeed as the bottom was gravel or ballast, it would probably be firm enough to resist the indentation of the sole piece, and there would be a hollow under the entire platform. By the kindness of Mr. Page, the engineer to the new Westminster Bridge, I am able to put on the table a part of the sole piece of this caisson bottom, and must draw your attention to the thoroughly sound state of preservation in which it is found. Each caisson contained, according to Labelye, "150 loads of timber, or as much as a 40-gun frigate of that day," but certainly not so much as a frigate of that size at the present time.

The difficulty in the construction of these foundations, even supposing them to have had a sufficient substratum and one not liable to be scoured away, was to dredge and maintain a level in ballast. So great was this difficulty found that piles of square fir, 7 feet apart, were driven down to a depth of about 13 feet below the surface of the bed of the river, at a considerable distance from the holes and all round them. These piles had grooves in their sides in which boards were placed and cleeted down under water to a height of 2 feet above the bed of the river, to prevent the silt from being carried into the holes.

The foundations for this bridge quickly gave way, indeed during its construction two arches had to be removed and re-built, and Mr. Walker, the engineer, states in his evidence that the caissons sunk in the middle, and the sides and ends which projected beyond the stone work broke off and were twisted up. Mr. Walker attributes these defects to the want of sufficient original area in the holes for the caissons, and to the fact that the holes were probably hollow in the centre when the caissons were deposited; but it would appear that the sinking of the very bearing area of the substratum under the partial and unequal pressures of the caissons has had more to do with the failure than any other defect, for notwithstanding the beech sheet piling which was driven round the piles at a distance of 6 feet, and the inclosure by this means of some of the piers so that no scouring could take place, they have since sunk, and this after the removal of between 20 and 30,000 tons by alterations of the superstructure.

Blackfriars Bridge was built by Robert Mylne, in 1760 to 1771, it consists of nine semi-elliptical arches in Portland stone, the largest of which is 100 feet span, with a rise of 41 feet. The piers are about 27 feet 6 inches wide at their foundations. This was the first introduction of the elliptical arch into this country.

The foundations for this bridge were also laid in caissons, but the holes in which the caissons were placed had piles driven into them about 9 feet apart each way, placed probably more with a view to preparing an even surface for the caisson bottom than for support, since they were very shallow and there were only forty-five to each pier. The heads of these piles were cut off under water. In their evidence before a Committee of the House of Commons Mr. Rennie and Mr. Walker attribute the stability of this bridge to these piles. Sheeting piles, but of no great depth, were also driven round the out-sides of the caisson bottoms.

The foundations of this bridge also settled not long after the removal of Old London Bridge had occasioned the increased scour, which took place in the above-bridge bed of the river, and they were subjected to repairs by Messrs. Walker and Burgess, which resulted, as at Westminster Bridge, in the expenditure of large sums of money uselessly. Sheet piling was driven round the piers and caisson bottoms, the intermediate space was filled in with concrete, and a stone pavement carried on the top of it to the lower course of the foundations. These repairs to both bridges, by Messrs. Walker and Burgess, seem to have been based upon the experience of starlings at London Bridge and elsewhere. They seem to have believed that if the scour could be prevented, and nothing carried from under the foundations by external agency, the clay would support the gravel, and the gravel the stone; but the pressure upon each square foot of these foundations was, in Westminster nearly 5½ tons, and at Blackfriars probably 5 tons per square foot, and clay under the most favourable circumstances, when the pressure is at great depths within it and the mass has been in no way disturbed, will not bear so much as 5 tons per square foot pressure. The sheet piling driven round these piers broke the homogeneous mass of the clay, and converted the portion which it inclosed into a square block of compressible material, which as might have been foreseen had due examination been made, the superincumbent pressure was too much for—the piles then gave way laterally, and the object for which they were inserted was not even attained. Now in Old London Bridge the original piling was never disturbed: the true bearing of the piles, though they existed only at the outsides of the foundations, was sufficient, and the starlings, sheet piling, and filling in were only adjuncts to the strength, and were necessary only on account of the extra weight in width, and the structures upon the bridge which were added from time to time. I beg to draw your attention to a small drawing of a pier of old London Bridge, which was removed to make a water way during the construction of the new bridge, and which shews the original bridge on piles, which though only round the outside of the pier were so placed as to carry the whole weight, and the extent of surface to which the starlings and extensions of the pens were carried. These piles when drawn were as sound as when put down; portions of them are now in the possession of more than one architect and engineer, and though upwards of six hundred years old they are convincing proof of the permanence of pile foundations, when thoroughly embedded in the earth.

Waterloo and London Bridges, which were both built by John Rennie, have both the same kind of foundations. Waterloo Bridge, built in 1809 to 1817, has nine equal semi-elliptical arches of 120 feet span and 35 feet rise; and London Bridge, built in 1825 to 1831, has five semi-elliptical arches, two of which are 130 feet span, two 140 feet span, and the centre arch 152 ft. 6 inches span, with 37 feet 6 inches rise; it is 52 feet wide, none of the other bridges, including Waterloo, being more than 45 feet wide. The foundations of both these bridges were constructed in coffer dams. Into the construction of coffer dams it is not now proposed to enter, their object, their purposes, and their details being well understood in this room. The entire area of the bases of the piers is piled with elm piles, about 20 feet long and about 3 feet apart, and which penetrate the London clay, in the case of Waterloo Bridge probably to a depth of 18 feet, and in London Bridge about 18 feet 9 inches or 19 feet. On the heads of these piles were laid sleepers, and the loose earth between their heads was replaced with rubble concrete, on which blocks of Bramley Fall stone and brickwork filled-up the spaces between the pile heads, immediately below the platform of oak planking which carried the first course of granite masonry.

The pressure upon each pile in London Bridge has been estimated at 80 tons, or about 5 tons per foot superficial on the entire area, and this is considerably below what the piles would actually carry. The difficulty of applying sufficient dead weight upon piles, to ascertain their bearing powers in equilibrium, has always prevented the formation of any formula or data on which engineers can base their experiments. The piles are driven and the pressure they must be sustaining is then calculated after the load is on, no maximum having been ascertained. At the border bridge on the Newcastle and Edinbro' Railway, the calculation shewed that each pile must be sustaining a weight of 70 tons. The pressure on each pile of Waterloo Bridge is probably somewhat less, but still it must amount to at least 68 tons.

London Bridge has a close pile sheeting all round the platform, which penetrates about one-third of the distance of the main bearing piles. Waterloo Bridge does not appear to be so protected, yet London Bridge after the removal of the coffer dams settled in every pier from 6 inches to 10 inches towards the down stream; this was attributable to the entire area of the river substrata finding their proper bearing after the disturbances to which they had been subjected by the piling of the coffer dams and of the centerings. The coffer dam above bridge was in 35 feet of water below low-water mark, and the piles were consequently very deeply driven, and though those which were near to the piers, or could apparently affect them, were not drawn but cut off, the mass of the clay had received a disturbance which settled itself probably once and for ever, and if the bearing areas and the tenacity of the piles are sufficient for the superincumbent pressure, no further settlement need be apprehended.

Southwark Bridge, also built by John Rennie, was erected in 1814 to 1817, the spans are 240 feet in the centre arch, and 210 feet each side arch. The arches are segmental in eight cast-iron ribs, and rise about 22 feet. The two piers are each 24 ft. wide, they were built in coffer dams upon piles which were about 2 feet 6 inches apart, or even closer, and 20 feet deep; the drawings which I have been enabled to examine, represent about 286 piles under each pier: the platforms for the first course of masonry were made in a similar manner to those of London and Waterloo Bridges, and no settlement has taken place as far as I can learn, nor has any repair of moment to either sub—or super—structure ever been necessary.

Vauxhall Bridge, by James Walker, was built in 1811 to 1816; it consists of nine segmental iron arches in ten ribs of equal spans of 78 feet, the rise being 11 feet. The foundations were laid in caissons, which were sunk down to the London clay, the river being dredged I believe in its entire breadth for that purpose; the footings are in stone, no subsidence has been recorded; I have not been able to learn the precise means taken to prevent the scour from undermining the caissons, but I believe that Kentish rag and ballast was thrown down around the piers in vast quantities.

Hungerford Bridge was built by I. K. Brunel in 1844; the foundations of the two piers which carry the chains, rest on a bed of gravel which is stated to be as hard as a bed of artificial concrete. No piles were used in the foundations, a coffer dam being formed round the piers, and the ground was excavated down to the hard gravel which was found about 6 feet below the then bed of the river.

Below the mud (and until the hard gravel was met with) gravel of a looser kind was encountered. On the Hungerford Market side of the bridge at the mooring piers, the ground was very bad, piles were here driven to the depth of 30 feet. Mr. Brunel terms the beds on which the bearing piers rest, two oases of hard gravel (as hard as concrete) forming a natural formation, situated in the midst of a looser soil.

Chelsea Bridge, erected by Mr. Page in 1850-1857, is a suspension bridge, the chains carrying which pass over two piers in the river, each of which is 88 feet long by 19 feet 3 inches wide, the foundations of which consist of bearing piles of elm, 13 inches square, 3 feet 6 inches apart, driven to an average depth of 32 feet below low water mark, which would probably in that situation give a depth of about 16 feet into the London clay. These piles were driven to a test which ensured their capacity for resistance to a much greater extent than their ultimate individual load could ever be. Cast iron piles 12 inches in diameter, and 25 feet long were then driven 20 feet into the ground (probably about 10 feet into the London clay), all round the bearing piles, and in grooves on their sides, cast iron plates were driven down between them, so that each pier is encased in iron, to a depth sufficient to prevent its being injured by the scour, or wearing away. The casings are filled-in with brick-work in cement, built in cross walls, and the cut-waters with solid work.

In New Westminster Bridge the same principle has been adopted, but from the importance of the work it merits a somewhat more extended description. When it was determined that the new bridge should occupy the site of the old one, but be of twice the width, Mr. Page proposed to erect one half of the bridge first and open it for traffic, before the demolition of the old bridge; and after many delays, and an interference by the Chief Commissioner of Public Works, who desired to be satisfied of the principle of construction adopted, this work is now being carried on, and presents a striking example of the progress which has been made in the economy of construction.

The bridge will have seven arches, the centre of 120 feet span, the two next it of 115 feet span, the two next them of 104 feet 6 inches, and two next the abutments of 94 feet 9 inches span. These arches will be of a curve approaching to the four-centred arch, and each will be constructed in 15 ribs of cast and wrought iron; the bridge will be 80 feet wide, the piers at the bases are 18 feet wide, and will be 110 feet long, the south or upper halves of them of 55 feet wide, are now in course of construction. Elm piles 32 feet long are driven in alternate rows of three and five each, to the number of 145 in each pier, and these piles penetrate the London clay to a depth of about 18 feet, and each is capable of resisting without motion, and many I am informed have been tested to, a bearing weight of 60 tons. Round these elm piles hollow cast iron piles, 15 inches in diameter and 25 feet long, are driven 4 feet apart, and between these in grooves cast on them, cast iron flat piles are driven to nearly the same depth. These flat casing piles are each 13 feet 6 inches by 4 feet, and they are strengthened by flanges or ribs at their backs; these piles having been carefully driven, and their direction and fit examined by means of the diving dress, the soil of the river into which they have been sent and which they enclose, is dredged or rather scooped out until the hard gravel which superlies the clay is reached, and at this level iron ties, two to each flat plate are inserted, and concrete is filled in to the level of the tops of the piles, which are cut off about 6 inches below lowest water mark. This concrete is composed of Portland cement and river ballast in the proportions of 1 to 5, with a small per centage added for waste, and is applied after the method adopted by the French in subaqueous works, by a shoot or funnel which is carried under the water, and which is moveable to allow the concrete to be spread without too great dilution. Embedded in the concrete and resting on the top flange of the flat piles, is a granite casing 1 foot 8 inches thick, and on the heads of the elm bearing piles is a course of Bramley Fall stones, covering the heads of two or three piles alternately, upon this the bottom course of granite which is in stone of large bearing, is laid with a projection over the face of the outside piling so as to be a fender to them; a second course, the plinth course of granite, is also carried through the pier, as are also a bonding course midway, and the top course of the same material which carries the bed plates for the iron girders. Indeed from the quantity of granite used in each pier, the brick-work is mere filling-in, and the piers must be said to be granite and brick, and not merely brick faced with granite. Outside the pier the loose bottom and the gravel bed are dredged away to the clay, and concrete is to be inserted to a width of about 6 feet.

After this description of the different foundations of the piers of the bridges which are in existence in the river Thames, it will be seen that the conclusions which must be drawn from the practical experience of those foundations which have failed, and those which have not, are very limited, but they are at the same time very clear and simple; the bed of the river Thames is much lower than when the bridges which have failed were built, a fact occasioned by the increased scour produced by the removal of the dam which old London Bridge afforded, the contraction of the waterway by the projection of embankments, and though last not least, the ballasting which for a long period constantly proceeded above the bridges, and though now to a great extent prevented, yet sufficient from the dredging operations as well below as above bridge to deepen portions of the water-way by some inches annually. This deficiency is not made up again by the deposit of gravel or ballast, for the deposit of the Thames is silt, sand, and mud; and the original gravel bed of the Thames has been so reduced by dredging, and by the scour consequent on changes in the water-ways, as to be now only existing in sufficient thickness to be built on in oases as they were termed by Mr. Brunel, such as the parts on which the Hungerford bridge piers were constructed. Wherever, therefore, we find the foundations have been made to depend on the gravel, and have not been taken deep into the London clay, failure has taken place. The piers of Hungerford Bridge, the only exceptions to this rule, are so lightly weighted and situated so fortunately for avoiding scour, and have been so recently constructed, that they cannot be said to disprove it. The rule of experience is, that in the clay only can a sure foundation be found, and no casings have yet been added to defective piers which have held the enclosed gravel into a sufficiently compact mass to prevent its sinking by loss of substance through the joints of pilings. Down to the clay then we must go for a sure foundation, and the different methods of effecting this are the only points for discussion.

The old successful examples in London are all of one class, they are cofferdam examples with the exception of Vauxhall Bridge and the new bridges designed by Mr. Page. Vauxhall Bridge, as has been shown, was a caisson foundation carried to the London clay without piling, and the weight of the bridge is not sufficient to need piling. All the other sound bridges are piled deep into the blue clay. The shoulders and sides of these piles, and the surface of the clay between them at their tops, are the ultimate bearing points upon which presses the superstructure, whether of granite or stone courses, or of compound concrete and wood, or of iron: Theory would say, upon this foundation make the superstructure as light as is consistent with even pressure and avoidance of jarring which may cause motion, every pound you place on the shoulders of the piles, or upon the earth's surface at their heads beyond what is required for inertium is useless and superfluous. To maintain the piers in perfect inertium, and immovable under the pressure of water, floating ice, or drifting sailing barges, or unskilfully directed steam-boats, and the heavy road traffic over the bridge, requires a much less weight than would result in an equilibrium between the bearing surfaces and the pressure; it is not necessary to have solid granite from the bearing points to the voussoirs for equilibrium, and almost any materials that can be used are in the tidal currents of our river sufficient for this purpose. It is perfectly true that London and Waterloo Bridges would be absolutely stronger constructions theoretically, if their piers were not so enormously heavy, and were built of brickwork, or hollow.

The objections which have been made to the foundations for the new bridges designed by Mr. Page, of which experience has not yet been had, are resolved if these views be admitted into the question whether the bearing points of his piers are in the London clay, whether there is a sufficiency of resistance within that clay, and whether the superstructure of the piers is sufficiently strong to be always in inertium.

With regard to Westminster Bridge, after a careful examination, I must express my belief that these points are amply provided for. The bearing weight upon each pier cannot be more than 2000 tons according to my estimate, the 133 elm bearing piles in each pier, therefore, omitting the cutwater piles, will not have a pressure of above 15 tons upon each, supposing the load equally distributed, and that no assistance is derived from the intermediate clay, but as is proved in the case of London Bridge where the piles are not deeper nor larger, they could have 80 tons without deflexion, we may omit therefore the intermediate clay with its compressed and confined natural gravel surface, and the concrete over it; but we must be sure that the piles will be maintained perpendicular within one fourth as true as they would be if in a similar case to those of London Bridge, they had been driven down into London clay for their entire length. The concrete and the iron casing I believe to be ten times a stronger medium for the retention of the piles in their places than the London clay at whatever depth would be, and I omit therefore all aid from the external piles and casing in bearing the weight, and find that the 133 elm bearing piles are alone capable of bearing, if all equally taking the superincumbent pressure, a load four times as great as can ever be upon them, and this leaves ample margin for unequal bearing, supposing any to occur; great precautions are taken against this however, and there is not so much occasion to apprehend it as with cross sleepers and bearing planks such as exist at the successful bridges.

With reference to the superincumbent pier, I confess that the solid granite courses which Mr. Page, at the suggestion I believe of Mr. Stephenson has inserted, are better for the purpose of immobility of the pier from external influences, besides the dead weight it has to carry, than the system of brick cross walls and arches that he originally designed, though these were, I dare say, sufficient for the purpose; and, therefore, looking only to the elm bearing piles and the brick and granite superstructure, without reference to the external plate and fender piling, I believe Mr. Page's piers to come within the conclusions of success which may be derived from experience in the Thames.

Now, with regard to the destruction of the foundations of piers in the river by scour, I think the ultimate depth of the scour will never under any possible circumstances extend sufficiently far down the piles of either London, Southwark, Waterloo, or New Westminster bridges, to cause any apprehension on this score, and simply renewing the casing and filling round the piers with concrete will be enough to prevent their injury, should a tendency to scour be observed. The river has deepened only in places for some long time since its great deepening by the removal of London Bridge. When embankments are carried through on each side, as we must all hope they will be, and the channel narrowed, the equalization of the depth will at that time prevent any serious increase of scour.

The methods proposed to counteract this effect by Mr. Cubitt and Mr. Hosking, would also prove effective to preserve bridges founded so deep as those piled into the London clay, though they would not probably have preserved either Westminster or Blackfriars. Mr. Cubitt proposed to pave the bed of the river with stones for a distance above and below the bridge of some 60 feet I believe, as well as under the arches, and Mr. Hosking proposed a sub-weir of piles across the river to a height which should prevent the rush of water degrading the existing bottom of the river, and he showed that ample water would remain at low tide to answer every purpose of the navigation.

Le Creult, chief of the French Ponts et Chauseès in 1780, in his work on rivers proves that the beds of rivers do not change sensibly when considered throughout their course, but that local causes alone occasion increase or decrease of depth in the beds in different places, and not throughout their length, and the Thames being subject to no violent floods, and having on the whole very steady tides, it is not probable that unforeseen and unpreventible injury should occur to deep-seated foundations well protected in its bottom.

The inquiry into this subject has led me to seek information as to any failures from scour which have occurred to bridges abroad, and I cannot find an instance of a deep-piled bridge which has fallen, many have needed repair, and most of them have of late been strengthened by throwing in concrete round the piles, and no question seems ever made of the stability of this enclosing medium, or of its tenacity to the wood piles. Indeed, the employment of concrete by the French in hydraulic works is far in advance of our application of it hitherto. They do not scruple to use it without any encasement whatever in the beds of swift rivers subject to violent torrents during floods.

Upon the subject of the durability of the encasements of the piers at Westminster and Chelsea bridges there exists some difference of opinion; for myself, I think that if the hollow piles are filled with cement grout, they will, as respects the buried portions of them, be almost as durable as the other portions of the structure, and will be as compared with past constructions, whether Pelasgian, Grecian, or Roman, indestructible; but as respects the portions out of the clay, unless some preservative is applied to them, they will not endure probably more than three hundred years. It was Mr. Hawkshaw I believe, however, in his evidence before the Committee of the House of Commons on this point, who said that by the time that any decay of moment had occurred to the iron casing, the condition of the other portions of the structure would be so stable as to admit of its removal and replacement without danger, and when we consider what has been done both at Blackfriars and Westminster in the way of cutting at the old foundations, I have little doubt that these piers could be with care re-encased without any danger to the foundations, which it must be always remembered is deeper than the pile casings, and not above them, as was the case at those defective bridges. Screw piles might at any time be placed a short distance outside them without any risk from vibration or concussion in the strata.

The use of the diving-bell and diver's dress is much contributing to the efficient performance of these works at Westminster Bridge. These inventions are, however, quite in their infancy, and there is little doubt that so great improvements will be made in them, as to enable sight as well as touch to be used at greater depths than now. They are not however essentials to the proper driving of iron piling. At the foundations for the Gravesend pier which were composed of piles 15 inches in diameter, which required to be driven at triangular points with the greatest nicety to a depth of 10 feet into the chalk, a harder medium than the blue clay, not more than six out of fifty-four piles required chipping, and the greatest variation did not exceed ¾ of an inch.

Into the subject of the abutments of the bridges we have not time now to enter, nor are the conditions similar, or the methods of founding them so different and peculiar as to require separate notice. Nor do I now propose to examine into the question of the building of the foundations of the New Westminster Bridge in two halves at separate times. I am of opinion that the first few piles next the half of the piers which have been built should be screwed in and not driven, and then there will be no risk to the work, but bearing in mind the settlement in the pier of the old bridge repaired by Mr. Walker, and which carried down not only the old pier but the new work also, and the settlement at London Bridge, I should fear any disturbance, however slight, in the London clay—not that danger is to be apprehended, but such a settlement as occurred at London Bridge after the removal of the coffer dams might, I think, occur, and after the energy and perseverance which has been displayed by the engineer to this bridge, any such untoward accident could not but be a subject of great regret to all independant professional men who sympathise with the interference with this great work which was occasioned, not only by the Chief Commissioner, but by practical men, whose knowledge of the consequences of the experiments already made in the Thames might have led them to show greater consideration.

Mr. **Matthews**, Associate, said he was exceedingly glad that such a practical subject had been brought forward; for it was too much the idea out of doors that the Institute was a Dilettanti society, or at the most, that it represented and taught architecture as a fine art only. He regarded the architect as the father of the engineer, both military and civil. In former days the architect was certainly a military engineer—San Michele was inventor of the bastion system. Architects had also frequently been successful bridge builders. Indeed, both as a man of science and taste the bridge is peculiarly within his province. Mr. Boulnois had treated the subject not merely as an architect, but as an engineer. He (Mr. Matthews) had extracted from Mr. Page's report on the foundation of Westminster Bridge, some of the data as to the weights and loads to which piling had been subjected in dock work and bridge foundations, and he found that at Hull Docks the piles were 10 in. diameter, carrying a weight of 37 tons per foot super. At London Bridge the piles were 10 in. diameter, and carried a weight of 80 tons per foot; at the Albert Docks, Liverpool, the piles sustained a weight of 80 tons per foot; whilst at the new bridge at Westminster, the piles would be 14 in., and they would only have to carry 12 tons per foot. Mr. Page stated that elm piles, such as those used in the foundations of Westminster Bridge would carry 200 tons each without permanent deflection, and the facts referred to appeared to bear out the figures given by Mr. Boulnois. With regard to the piles of Old London Bridge, he (Mr. Matthews) rather more than a year ago, had had occasion to go down to them, some 30 feet under high water mark, at a time when a large warehouse was being built on cast iron piling and sheathing. The piling of the old bridge was reached in sinking a shaft which became necessary in consequence of the snapping of the iron piling of the warehouse, and they were found to be as perfect and as sound as the day they were driven.

Mr. M. D. **Wyatt**, Hon. Sec., asked if the piles were entirely embedded in the clay, and not exposed to either water or air.

Mr. **Matthews** said they were in the clay, and 10 feet below low-water mark. Oak and elm appeared to have been used indiscriminately.

Mr. **Jennings**, Fellow, felt great doubt as to whether piling was altogether the best system that could be adopted for bridge foundations. The bed of gravel which covered the London clay, if it was of sufficient thickness, formed the best foundation that could be had; and it appeared to him somewhat doubtful whether it would not be the wiser plan, when that natural bed of gravel did not exist, to spread an artificial bed of gravel over the clay to form as large a base as would suffice for the purpose; or again, whether a concrete foundation would not be better than any system of piling. In his own experiences of concrete foundations he had found that Roman cement answered the purpose more perfectly than Portland cement. The piles which he had examined in connection with the River Thames appeared to have stood well, though partially exposed, and those which he had drawn had been in the ground only sixty or seventy years, and were made of round timber; but whether piles stood better round than square he had no means of judging. As illustrating the failure of some of the London bridges the case of the Victoria Docks might be mentioned. It was there found that the London clay was unable to resist the lateral pressure, and although the pressure might have been unequal, still the fact that piles would move at all in such a situation, shewed that they did not form a perfectly good foundation. He thought if there had been a larger portion of concrete the piles referred to would not have given way (as they had) entirely from lateral pressure. With regard to the alleged waste of money on the foundations of Blackfriars' Bridge, Mr. Walker had told him that the amount was not more than a year and a half interest on the sum which it would cost to rebuild the bridge; and if so, the money could hardly be said to have been wasted. Mr. Jennings further referred to the tendency of piles, shod with iron and pointed, to sink gradually into the London clay, and thought that screw piles with flanges would have very little of this tendency.

Mr. M. D. **Wyatt**, Hon. Sec., observed that piles might be placed in three different positions, which would furnish corresponding sources of durability or decay. They might be driven entirely into and covered by the clay or other soil; or they might be partly in clay and partly exposed to water, or they might be partly in clay and in water, and be exposed by variable tides or evaporation to the atmosphere also. A pile being driven from the head, the wood became compressed, but by the action of water the fibre swelled again; and if alternately exposed to drying and being wetted, the fibre of the wood by alternate swelling and shrinking became disentegrated and the pile would rot; but when a pile could be completely driven into the clay its duration was indefinite. Although the strength of piles to resist vertical pressure chiefly depended upon the material in which they were driven pressing equally against their sides, still to a considerable extent, a pile shod with a sharp point would act as a wedge, and would not bear the same weight as it would if the end were more spread, though, of course, in the latter case, the difficulty of driving it was increased. M. Viollet le Duc, in his work on Mediæval Architecture, had shown that the best piles had rough points, with the ends charred; thus in the action of driving them they at first entered the soil readily, but, as the blows continued, the end of the pile spread, and getting a better hold of the soil, ceased to act as a wedge, and became more stable than if any other form had been used. It was a well known fact that the durability of timber was immensely increased by undergoing any change, such as that which the bog oak of Ireland had undergone. This was almost as hard as flint, and its existence dated from quite an indefinite period. In Venice it was found that when the piles had been driven down to the level of the soil, and when their heads had been cut off in the water to receive a planking of flat boards (the piles being exposed to the action of the earth, and scarcely to that of the water) they had stood very well, as was shown at the Cathedral of Murano and other old buildings; but in the modern buildings, where sheet piling was used, and where the piles were partly exposed to earth, water and air, they had been found to give way.

Mr. **Penrose** observed that a great deal of trouble had been caused for many years by the washing away of the starlings of old London Bridge, in consequence of the scour of the river. The old gateways on the bridge were pulled down, and their materials thrown down to repair the starlings. He believed it was stated in Domesday Book that the piles under these starlings had not been always entirely under water, and that the fishes had swam in and out from under them; but as these piles were found to be perfectly sound, this would not appear to carry out Mr. Wyatt's view.

Mr. C. **Barry** said that few questions could be more important than that of the destructibility or indestructibility of timber for sub-foundations, and as facts were worth more than any theory, he might mention the case of a heavy building in London, 120 years old, which was built in a boggy soil. Elm piles had first been driven, without much force being required, and on these there was an elm planking upon which the walls of the house were built. These walls were carried sufficiently below the surface to apparently protect the timber entirely from air; and upon examination the timbers were found, excepting in one or two instances, to be perfectly sound. Where there were any decayed he was inclined to attribute it to the timber having been used in too green a state, but where it had been originally sound, well grown and mature, it was found in a very good state, the arrises complete, and the surface as entire as when it had been laid down. The mortar joints of the lowest course of brick-work were plainly discernible. This was an illustration of the indestructibiliy of piling used in earth the surface of which was more or less a sponge, and which must have been completely saturated with water; and therefore if water would have any effect it must have had it in this case.

A Member said that he knew of a case of a similar kind at the East end of London, where an old shop was built upon oak piles and planking, where the timbers were sound, but the walls of the building, which was a heavy one, were in a state of considerable danger.

Mr. M. D. Wyatt. The safety of piles in earth depends upon their being entirely covered, and not exposed to a variable action, and clay was the best of all covering materials for durability.

Another Member mentioned the case of a large building close to the river, built about a century ago, apparently on elm planking. The soil was always wet, and the building had settled in every direction. The timbers were found perfectly rotten, and it was necessary to substitute concrete for them.

Mr. Jennings observed that where timber was merely subjected to damp, without being really under water, it always decayed. About Piccadilly many houses were originally built on planking. An improved system of drainage took the water to a lower level, and the houses had to be underpinned, but the planking still stood.

Mr. Haywood, Fellow, stated that the line of the river Thames was formerly 30 or 40 feet north of the present line of Thames Street; and that in excavating in the neighbourhood, the piles forming the facing of the original line of wharfs were found to be substantially sound, whether above or below high water mark. These piles were occasionally of oak, but more frequently of elm, and many of them must have been buried beneath the soil from 200 to 400 years, the soil being at all times so very wet that by digging only five or six feet a pool of water was found.

Mr. M. D. Wyatt suggested that it might be possible that woods containing resins that were not soluble in water, might be most durable; and if so, that timber employed for these purposes should be used when it was full of these resinous saps, and should be immersed in water so that they could not evaporate. In Ireland there was a peculiar class of monuments, namely, the old residences or rude castles in the midst of lakes, which were held by the native chieftains before and during the English invasion. These were formed by driving piles into the bed of the lake in the shape of a ring, and then bringing soil from the banks of the lake and filling up the ring; many of the castles so constructed dated from the year of the Conquest; they had been investigated recently by the engineers engaged on the Ordnance Survey of Ireland, and the piles had been found in a very perfect condition.

Mr. Jennings observed, that if the lakes referred to were impregnated with bog water that circumstance would tend to make the piles more durable.

Mr. Wyatt concurred. The bog water was of an antiseptic nature, and would destroy the action of insects, as well as prevent the general decay of the wood.

Mr. Jennings said that a very large portion of London was built on beds of bog, from six to eight inches thick, which would have a considerable effect in preserving timber.

Mr. Wyatt. Those patches of bog might themselves be the product of decayed wood.

Mr. C. H. Smith, Honorary Member, said that he was not aware of any effect which moisture could have upon pure resin; and it was well known that the preservative effect of the turpentine contained in yellow deal was much greater than that of any bog water could be. Some years ago he had examined a large house in Yorkshire, belonging to Lord Down (erected by Sir John Vanburgh), and the walls of which had cracked in a variety of places, from top to bottom, although originally of great strength. This building had been constructed entirely upon planking, either with or without piles. This planking was from three to five inches thick, and there was a great deal of fir timber in it, and where the timber had a quantity of resin in it, it was not affected by damp, and the walls were sound; but where there was no resin in the planking it had decayed and become compressed, and in some places was not more than an inch and a half thick, which was quite sufficient to account for the sinking and cracking of the walls. He understood that a deceased architect formerly connected with this Institute had advised Lord Down to wait till all the timber planking had decayed; but he (Mr. Smith) thought it would be a very long time indeed before that decay enabled the building to resume its original level.

A Member thought that it was very desirable to get rid of the timber platform, which seemed to be the real source of decay, and if possible, to lay a foundation of concrete upon the piles themselves.

Mr. Wyatt said the great thing in bridge building was to get rid of the outer piles which rose into the water, and which presented faces which were acted upon by every change of current, thereby disturbing the solidity of the clay in which they were embedded.

Mr. Boulnois in reply to Mr. Jennings's remark on the superiority of concrete to piling, observed that unless a superficial area could be obtained, such as would involve a very great encroachment on the water way, no concrete or other material could be made sufficiently resistant to carry the superincumbent weight. The London clay would compress at five tons per square foot, and concrete without piling must extend over an area of water-way which would never be permitted. The failure at the Victoria Docks was an exemplificaton of the necessity of maintaining the London clay in its original position, without any interference by piling or driving in its adjacent neighbourhood. [Mr. Boulnois made and explained an illustrative sketch.] The case referred to by Mr. Matthews, in which iron piles had snapped, shewed the difficulty of dealing with them, as they were far more likely than wooden piles to break on coming into contact with nodules in the clay. He agreed with Mr. Jennings that Roman cement would set quicker and be apparently harder than Portland cement, but when the former became broken or destroyed, any stones which had hard surfaces and were not porous would come out of it like eggs, whereas in Portland cement he thought the contact with smooth stones was much more perfect. If none but porous stones were used the Roman was as good as the Portland cement. Mr. Boulnois referred to the items of the expence incurred in repairing Westminster Bridge and Blackfriars Bridge, which he thought shewed that Mr. Walker had greatly understated the matter, in saying it was only a year and a half's interest on the cost of re-erection. The circumstance mentioned by Mr. Lewis was very singular, and had very often puzzled people who had to deal with waterside premises. It seemed that although the water was always there, there were different degrees of water, and air, and the water was not in sufficient quantity to exclude the oxygen, the timber being simply damp, and not entirely submerged. The fact stated by Mr. Hayward as to the river having formerly risen up towards St. Paul's was curious, and it would be desirable, if possible to have further particulars on the subject In conclusion, Mr. Boulnois expressed his thanks for the interest which had been shewn on the subject of his paper.

The Chairman (Mr. Gilbert Scott, V.P.) said, there could be no question whatever, that on a clay foundation, like the bed of the Thames, piles were better than any other method. When we consider the enormous force required to drive piles 30 feet into the bed of the river, it appeared almost self-evident that the weight they would bear would be greater than that of the stratum into which they are driven, and by scientific experiment it is proved that whilst the clay itself would only bear a pressure of five tons per foot, these piles would carry from seventy to eighty; therefore, on this point there could be no doubt as to the use of piles, or their ability to bear the weight, if the piles were durable, which they must be under the bed of the river. The real boldness of Mr. Page's experiment at New Westminster Bridge (and he was entitled to great credit for the attempt), was to build not merely on the tops of piles, but upon a pier formed of piles rising through the water, and almost to its surface. The reasons which had been given seemed to give every reason to hope that the plan would answer, but it was an extremely bold experiment. There was no reason why piles should decay at six inches under low water mark, any more than if they were thirty feet below it; nor was there any reason why they should sink deeper because they were longer than usual. The only question was, whether there was any danger of their moving laterally, together with the sheet piling of iron, and the immense mass of solid concrete between them. The look of that mass of concrete, and of the entire plan, seemed to give every possible reason to feel confidence in the theory involved, and in the stability of the structure. If it succeeded, Mr. Page would have established a new system of bridge building which would be safe and practicable without the use of coffer dams. As architects however (admitting that engineers had taken bridge building to a great extent out of their hands), they were more interested in the abutments of bridges and in water-side buildings, and with regard to these the question remained unsettled whether concrete or piling formed the best foundation; many instances having been cited to shew that in some cases piles had stood thoroughly well, and in others that they had not. He had been engaged with Mr. Roberts when the present Fishmongers' Hall was built, and there the immediate foundation was concrete, on a bed of muddy peat, in which there were a great number of old piles. These piles were almost entirely of oak, and they were in such a high state of preservation that the breakage of the grain from the force with which they had been driven was quite distinct; and on cutting the head of one of them it was found unaltered in colour and hardness. It had in fact, a nice fresh yellow colour just like a new piece of wainscot. This was probably partly the effect of the peat, which had preserved grass, nut-shells, &c., in excellent preservation. At Hackney Church, far away from the river, the tower was found to be sinking considerably, and it was found that this building had stood below the level of some land springs which had been carried off by an increased depth of drainage, leaving the foundations dry. On examining the foundations, a black line, about a quarter of an inch thick, was found in the course of bricks above the footings, and this proved to be the remains of a three-inch deal planking, which had been continued all through the thickness of the walls. The knots in the timber all remained probably from containing more resin than the other parts, and had been crushed up into the next course of brickwork, thus corroborating Mr. Wyatt's view of the value of resin as a conservative agent. An oak sleeper in the middle of the wall was also very much decayed. These cases appeared to shew that in a dry foundation neither oak nor deal could be expected to last long (the work referred to was not fifty years old); whereas in a wet and peaty foundation, oak would last almost for ever. But even taking it for granted that piling could not be successfully used, it would appear that concrete was just as much liable to failure and decay. Half the concrete used was perfectly inefficient against damp, and whilst the grey chalk lime commonly used was totally untrustworthy, he was equally convinced that blue lias lime was trustworthy. The use of gravel which was not perfectly clean was another cause of decay in concrete. Mr. Scott then referred to the use of trass (a volcanic stone from the Rhine) in combination with the best hydraulic limes as a concrete for foundations. He described from his own observation in Holland, the great pains which were taken in mixing these materials, and stated that the hardness of the mass was prodigious. He had brought some of this material home, and the result of comparative experiments which he had made shewed that, after being four months under water, the mixture of trass and lime had become as hard as stone, whilst the common concrete had utterly perished. He therefore thought this material might be advantageously used for concrete.

A vote of thanks was given to Mr. Boulnois, and the meeting adjourned.

After the close of the discussion, Mr. BLACKETT exhibited a model, showing the application of his patent lock to fire-proof safes, and other depositaries for valuables, and explained the principle of his invention. The novelty claimed in the patent appeared to be, the removal of the lock altogether from sight by placing it at the back of the safe instead of the front as usual; thereby preventing the application of reflectors, tools, levers, or other implements of lock picking, and altogether baffling the attempts of the most ingenious workmen to get access to it. The key was made with a handle equal in length to the depth of the safe, in which it was retained in a groove, admitting only of sufficient withdrawal to allow the wards, which were made separate from the handle, to be dropped into a portion of it with which they corresponded. The bolt securing the front door of the safe was then on turning the handle with the wards attached to it thrown from the lock at the back by a simple over-head action. Mr. Blackett was complimented by the members, who paid attention to his explanation on the ingenuity and probable usefulness of his invention.

A BRIEF ACCOUNT OF SOME EXPERIMENTS UPON CONCRETE MADE, IN CHIEF PART EXPRESSLY FOR THE COMMITTEE OF THE ARCHITECTURAL PUBLICATION SOCIETY.

By T. H. Lewis, Fellow.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, December 14, 1857.

The experiments here described were made chiefly with a view of verifying some facts mentioned in the description of "Concrete" in the Dictionary of the Architectural Publication Society; but I have incorporated with them the results of some other experiments previously made by me.

The general idea with respect to this material, is, 1st, that there is a sensible loss in bulk of the ballast, independently of that of the lime; and, 2ndly, that the materials, after being mixed together expand considerably. So much is this idea prevalent, that a respectable builder, one, I am sure, quite above stating anything that he did not believe to be true, required, in calculating the price of the concrete, that I should allow him one-seventh more ballast than the concrete cubed to; he depending on the published statements of the loss of ballast being thus great. It was this demand that first led me to make experiments.

The following trials were all made in the same manner; and, with one exception, I was present at the whole process from beginning to end. Several of the Committee of the Architectural Publication Society also attended at the trials. A wooden box was made holding exactly one cubic yard. This was filled with a fair sample of the ordinary Thames ballast, such as is used for concrete in London. To this was added ground Medway grey-stone lime, in the proportion of one of lime to six of ballast. The whole was then turned out and mixed together in the ordinary way, the cubic yard taking about forty gallons of water. The whole bulk would thus stand as follows:

Ballast		27 feet cube
Lime . .	4½	10½ do.
Water . .	6	
Total .		37½

The concrete, thus mixed, was thrown into the box from the level of the ground, so that the lower part would have a fall of about 4·0, and the upper part one foot. The experiment was also made of throwing it in from a platform 10·0 above the ground. In each case the result was the same, viz. that the whole mass, made into concrete, occupied precisely the same space as the dry ballast, viz. one cubic yard, all the bulk of the lime and water (being about two-fifths of that of the ballast) being lost, but none of the ballast itself. The surface was carefully levelled and thin boards tacked over so as to ascertain if there were any expansion in the setting, but none could be perceived..

The weight of the mass was 27 cwt.

I then had some more ballast mixed with a similar proportion of unground lime, broken into small pieces and wetted for a quarter of an hour. It was in that time pretty well slacked, but there must have been a good deal in the centre of the lumps not slacked. We know from every day experience of the blistering of plastering in internal work that a very long time is required to slack lime thoroughly, and I thought that as this operation must be going on to some extent after the concrete had been mixed and put into the box, a sensible expansion would take place. This however certainly did not, for not the slightest increase of bulk was perceptible. I had the first tried portion (mixed with ground lime) broken up about a week after it was made. The parts immediately below the surface, and all underneath them, had not set, but the whole formed a compact mass, without any vacuities whatever, the upper parts seeming to be as solid as the lower—though the difference in the fall was 3·0. A portion of it I put into water; I examined it in a fortnight, but it had not then set; I am sorry to say that I omitted to look at it again for a considerable time, so that I cannot speak as to the exact time of its setting; but when I took it out of the water seven months after, it was quite hard. I mention this in order to shew that the concrete was at least a good average sample. In order to try the matter more in detail, I had a box filled with very clean sand, such as is used by masons. The box was then well shaken, and the sand settled down, so as to lose about one-fifth of its bulk; the box was then filled up, so that in fact it was made to hold about one-fifth more than its ordinary quantum of sand. This was turned out and mixed well with water; after this it filled the box; but, on being shaken, subsided down to the same level as before, thus losing, in addition to the bulk of water, one-fifth of its own bulk as before. This wet sand was then mixed with one-third of its bulk of ground lime and made into mortar, which just filled the box. The surface was levelled and carefully tested during the setting, but neither expansion nor contraction could be perceived.

Another experiment was then tried at the suggestion of Mr. Wyatt Papworth:—A box was filled with coarse ballast and one-seventh of unground lime added to it, the lime being broken up into smaller pieces, but not very carefully, and then mixed with the ballast. Water was poured on, and the mass thrown into the box, when only partially slacked, the object being to see the effect of this process, which might be considered a tolerably fair example of what the men might do, if they had a certain portion of work to do with unground lime, without proper inspection, and careful only to get the whole done as soon as possible. The result was a slight but decided expansion. I then had another box filled with ballast which was mixed up dry with rather more than one-sixth of its bulk of ground lime; on being put into the box again, the two together occupied a rather larger space than the ballast did separately; the mass was then levelled, and about as much water poured over as would be used ordinarily; the result was, as before, a decided expansion.

One other experiment I should be glad to mention, as it is a curious one, and bears upon a part of the subject very little I think understood, viz. the setting and hardening of the concrete or mortar. A friend of mine, who is a first-rate chemist, suggested to me some time since that the addition of a carbonate to the mass would cause it to set more quickly, and for this obvious reason; that as the lime is supposed to be hardened by the absorption of carbonic acid, any substance in combination with that acid would offer to the lime its hardening medium in greater quantities than could be procured from the air in the same time. He further stated, though he could not procure me the details, that the experiment had been tried on a somewhat large scale with carbonate of soda mixed with concrete, used under water, and with complete success. I therefore had some more concrete made, and mixed with carbonate of soda, as directed. It was put into water, and in sixteen days was firmly set. Similar concrete, but without the soda, was not set at that time. I tried some mortar made in the ordinary way, and some also mixed with carbonate of soda, but in a larger proportion than with the concrete. This experiment was, however, not encouraging, as the mortar in setting crumbled to pieces.

I think that this artificial hardening might, as the process is a cheap one, be further experimented on with advantage.

ON COLOUR AS APPLIED TO ARCHITECTURE.

By George Aitchison, Jun., B.A., Architect.

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Thirty years ago it would have been necessary to establish a continuous series of proofs, from the red cheeked ships of Homer to the painted ceilings of Hampton Court or Whitehall, to obtain a hearing on the subject of colour when applied to Architecture. Indeed a very few years since people could with difficulty be brought to listen with patience to any account of that which they firmly believed never existed; and if a few, more learned or more credulous than the rest, lent an ear to some antiquary's account of the traces of painting on a building, they made up for their forced belief by setting down all ages in which Architecture had been coloured as barbarous: nor were they to be blamed, for every tendency towards a delight in beauty of colour had been religiously rooted out, and for more than a century the very feeling was looked on as a wicked and degrading indulgence; and consequently the coloured objects which met their eyes were a sufficient excuse for calling any people barbarous who had used such decoration. At present public opinion has changed, and it would be waste of time to attempt to prove that which is allowed on all hands, that in almost every age preceding our own, buildings were painted. The question is no longer, did the Greeks and Romans, Egyptians and Moors, paint their buildings and statues, but what lessons can we learn from their painting. Was it harmonious and in good taste, or not? if it was harmonious, in what way did they produce that effect? We want them to tell us the secret of their success, not give us a pattern for imitation; so that we may hand down to posterity not a lifeless copy of the art of by-gone ages, but a new system of coloured decoration, which shall shew that we have advanced as much before them in the arts, as the discovery of the law of gravity and of the steam engine shews that we have in science and machinery. In almost every thing that serves our daily use or ministers to our luxury, we see colour more generally and more successfully applied than formerly; our figured silks and painted earthenware are frequently very pleasing, and we are beginning to rival in colour the carpets of the East; but in our buildings we seem to hang back from the general movement, and hundreds, if not thousands, of intelligent workmen are condemned to pass their lives in graining and marbling woodwork or plaster, who might be employed in painting on them the most beautiful ornaments. It may be said that these men are not artists; but the skill required to grain or marble would enable them, after a short time, to paint all sorts of ornament, if a proper cartoon, even to a small scale, were put into their hands.

In speaking of coloured decoration, I shall merely give a description of the different ways in which it has been employed in the various styles, pointing out what I think good or bad in the colour, but giving no opinion as to the style itself. I am waiting like the rest of the world for the new style that is to come; but until it does come, it appears to me that we shall not be doing wrong by making our coloured decorations as beautiful as possible, even though the originators of the style did not use colour, or used it very badly. If the forms of the decorations are good, colour will add to them an additional charm; if they are bad, colour will atone for their defects; for if colour be only good, we cannot have too much of it; if every building were most brilliantly painted, there would be plenty of relief for the eye in the mud and fog of our native land.

The history of painting, like that of nearly all the arts, is buried in oblivion; we know nothing of its beginning, its rise, or its progress; when we know any thing about it, it is a full blown art. Between the painting of the ships of Homer and the figures on the Tomb at Veii, there must have been many steps. Homer, it is true, speaks of sculptured figures and embroidered flowers, and does not mention painting; but whether there is sufficient evidence to confirm Professor Semper's views that painting and sculpture were mere transcripts from storied tapestry, I cannot say. The diapers, zig-zags, and chevrons of early work bear a curious resemblance to the patterns in woven stuffs; but whether the resemblance is only accidental, or whether the woven pattern not only furnished them with these, but with the more elaborate Grecian frets, as Mr. Owen Jones asserts, I must leave to some one more competent than myself to determine.

As soon as nations become sufficiently civilised to attempt close imitation, their efforts are chiefly directed to the representation of men and animals, and their buildings are the blank pages on which their history, religion, and science are to be written. The problem of disposition has been easily solved by almost every people in the same way; the walls, floors, and vaults were covered with a series of oblongs or parallel lines, squares or circles, in which were placed the pictures or sculptures, and between them a space was left to prevent confusion, this space being plain, or filled with writing, ornament, or both, as the case might be: the pictures must be protected from wanton or accidental injury, and placed at such a height that they could be easily seen by large numbers of people at the same time, the requirements of the building forming abitrary divisions. (The Jews and Mohammedans were forbidden by their religion to represent men or animals, but the ornament with which they decorated their buildings was subject to the same laws, and was treated in the same manner). The lower part of the walls was faced with marble or tiles, or hung with stuff or tapestry, painted in imitation of them, or ornamented with diapers, frets, or foliage; forming in fact a dado, usually of a darker colour than the rest of the building, to hide the dirt and stains left by the hands or clothes of the frequenters.

In applying the colours great technical skill was required: besides producing a general composition in which nothing offended the eye, and in which each part was harmonious, the artist had to use his experience in varying the tones, &c. when at a great height, separating those colours which he did not wish to blend by a white or black line, and making all in harmony with the background and in such relation to it that the whole might form a composition; without which it would have been a failure, as the background formed the largest mass of colour in the building. It is for this reason that I prefer grouping the different kinds of painting with reference to the background, instead of arranging them according to dates, or forming them into derivative groups. The grounds may be divided into *pure* and *mixed; pure* where the ground is entirely of one colour, which includes the gold, the blue, and the white; *mixed* where the ground is in pieces or patches of different colours. I propose to give a slight sketch of the kind of decoration used in some good example of each style; then to see what we know about colour; and afterwards to pass some of the more important examples in review, and find out whether the colouring is entirely arbitrary, or whether it appears to follow any law.

I have taken St. Mark's at Venice as the example of a gold back-ground. The pavement is of marble mosaic, covered with all sorts of patterns, scrolls, and animals; the walls (as high as the caps of the columns) are of polished marble, principally of a dark grey, brown or red colour; the columns are either of polished marble, granite, or porphyry; the foliage of the capitals is gold on a blue or red ground, and above is the gold mosaic, which covers the whole of the walls, spandrels, soffits of the arches, vaults and domes, and on which are the subjects and ornaments. The mosaics of St. Mark's may be roughly divided into the Byzantine of the Atrium and the Church, of about the date of 1100; those of the Baptistry of 1350; those of the Chapter House; and some scattered pieces, of the sixteenth and seventeenth centuries. The best mosaics are in that part of the Atrium at right angles to the Piazza (when I say the best, I mean as to the ornaments and the general effect of colour, but I do not attempt to criticise the pictures as works of art); the wall is filled with subjects in horizontal strips, and the vaults and domes are treated in the same way, except that the centre of each dome has generally a star or flower; the pendentives are sometimes filled with a figure or subject, and sometimes with a circle containing a portrait, with Byzantine ornament running into the angles; the ribs have figures or heads in panels with ornament between, or are entirely covered with interlacing ornament; the outer edge of the ribs is treated like a bead, and ornamented with flowers or zigzags, and a zigzag pattern is generally put above the string and the cornice of the domes. The general effect is that of a pale greenish grey, without any spot standing out or grating harshly on the eye; nearly all the figures and drapery are of a pale tint, weaker in tone than the ground, and the separation of the subjects is generally effected by masses of dark produced by black writing or by dark bands. The tone of the gold, though low, is generally nearer white than black, and consequently, where great distinctness of outline is required, black lines are used, and even black and white together, to render the line more cutting; but where the outline is not required to be so very distinct, such as on light edges, Indian red is generally used, (as nothing destroys purity of colour so much as a prevalence of black lines); if the color is white, it is outlined with blue, and in very many cases a simple white edge is used. We must not confound a practice with a necessity, and though painters and mosaic-workers very frequently used a black outline it was merely from their habit of drawing an outline and then working up to it. That I might be the more certain of this, I have examined a large quantity of the gold tissues of India, and I find that by far the larger part is not outlined at all, and that when they are outlined, the darker colours only have a black, and the lighter ones a red outline.

In the Baptistry at St. Mark's, we find the ornaments of a different character from that of the other parts, the drawing being more vigorous and more Roman than Byzantine in feeling, but the colouring rather inferior; the draperies and ornaments are no longer lighter in tone than the gold ground, but are generally darker; the edges of the arch and wall ribs, the lines above the cornice of the domes, &c.—that is to say, the smaller ornamental members are generally on a black ground with a very large pattern (the main body of the rib being white); the draperies are covered with enormous diapers, and are in some cases black and white in huge patches, so that the whole effect ceases to be perfect as a composition, the white and black catching the eye: the only piece of good colouring is on a wall rib in blue and gold; the blue a very deep shade, nearly approaching a blue black, and the pattern very much resembling one of the best at Pompeii. The Renaissance mosaics are generally greatly inferior to those previously mentioned; the artists of that period though too well satisfied with themselves to learn a lesson from the old mosaics, were yet obliged to use the gold ground to make their pictures match with those around, hence deep shadows and dark back grounds could not be introduced: of the use of pale but brilliant colours they knew nothing, so they made the drapery generally deeper in tone than the gold, and got great staring masses of colour that offend the eye: while their gold mosaic gives the niches the appearance of beaten brass pans, the mosaic itself being inferior in colour, and redder in hue than the old. It is not my intention to explain the method of working in mosaic, yet as I was led to seek for the cause of the superiority of the old grounds, I may as well mention the result of my observations. In the first place, all the old Venetian mosaic is on a ground of clear glass of a deep green colour, and it very often happens that the gold leaf only covers a part of the glass, or it covers it all over with fine lines like the fibres ot a decayed leaf; but in the later gold mosaic the gold is laid on a red opaque glass, which it covers very perfectly. In the next place, each piece of the old mosaic does not exceed in size a square of ¼ inch, except when used for outlining, when a strip ¼ inch wide and from 1 to 2 inches long is sometimes used, with a small square between it and the next, and these pieces are roughly cut and irregular in size; but the sixteenth century mosaic is in great pieces of from 1 to 2 inches, cut very accurately square. The greatest difference however is in the setting; the new is laid flat and pointed in pink mortar, while the old consists of long strips stuck in at the ends, leaving a shadow all round, which has the effect of breaking the tone. In gold tissues the same effect is got by forming the woof only of gold; and in pictures on a gold ground, the ground is generally diapered so as to break up the surface. Sta. Sophia at Constantinople, and the Cappella Reale at Palermo, which are two other complete specimens of decoration on a gold ground in mosaic, are said to be finer than St. Mark's, but as I have not been fortunate enough to see them, I cannot give any opinion on the subject. A small Chapel called the Orto del Paradiso, in Sta. Prassede, at Rome, is a small but very perfect specimen. In fact there is scarcely a town of any importance throughout Italy in which some specimens of gold mosaic are not to be seen. Paintings on a gold ground in the shape of anconas, diptychs, and subjects, are very common, but I do not recollect a complete gilded background to any building in Italy; the rooms of Marie de Medicis at Paris, of the seventeenth century, are wholly painted on a gilt background, and though I recollect that it was covered with scroll ornament in prismatic colours between the pictures, and that the effect was charming, I have no sketches or memoranda to aid me in giving a description of it.

We next come to the *blue background.* Blue mosaic was also used for this purpose, but the effect is very inferior to that of the gold, as the tone of colour is very dark, and the method of setting it only adds to its gloom: the Apse of Santa Prassede is a specimen, and there are very many others, especially at Ravenna, the most striking of which is the Tomb of Galla Placidia, of the fifth century. Here the ground is a deep blue mosaic, on which are the subjects; the dome is studded with gold stars, and the vaults with pateras; the arch ribs are white with flowers in colours, and round the arches is a gold vine on a blue ground. But the blue background is more particularly that of the painter, and from Cimabue in 1240 until about the time of Benozzo Gozzoli in 1400, a blue ground was the prevailing one for all sorts of wall decoration. I have taken S. Francesco at Assisi, and the Arena Chapel at Padua, for specimens, as later work is, as a rule, very inferior in point of effect.

In the upper Chapel of S. Francesco at Assisi, the dado is painted in imitation of diapered hangings of a dull red, green, or yellow colour, with geometrical ornaments of a lighter tone; these painted hangings have a border and hang in loops, over which is a painted string, and above is a line of pictures, separated by twisted columns, supporting an entablature, painted stone colour; the upper pictures are divided by bands of ornament; the vaulting shafts are painted in imitation of porphyry or serpentine, or covered with zigzags or chevrons; the caps had gold foliage on a red ground; the ribs of the vaulting are half octagon, covered with panels in mosaic; the side perpendicular to the vault is ornamented with scrolls or interlacing foliage; on the vault, between the ground and the ribs, is a wide band of the same sort: the ornament is almost always green on a red and blue ground; the vault is blue with gold stars and circular panels containing heads, and here and there a subject on a yellow or gold ground instead of the blue and stars; the wall and arch ribs are generally panelled, with heads and foliage alternating; the drapery of the figures is almost always lighter in tone than the back-ground, and the effect of the whole is that of a warm glow.

In the Arena Chapel the dado is in imitation of marble, with light styles and rails, and the panels in imitation of porphyry or serpentine, with figures of the seven Cardinal Virtues and the seven

Deadly Sins interspersed, painted in chiaro-oscuro; the pictures are divided horizontally by narrow panelling, filled in with mosaic, and vertically by wide bands, containing heads and foliage in panels; the barrel vault is divided into two by a cross band; the vault is blue, powdered with stars, and each half contains five circles with heads. The only difference in the colours and disposition from those at Assisi is, that orange is sometimes used to divide blue and red, and in the band that divides the vault, we have pink next black, and green on black. At the Campo Santo at Pisa, at the Bargello, and at Sta. Croce at Florence, the disposition is nearly similar to those already mentioned; at S. Benedetto at Subiaco, and at Sta. Maria in Classe at Ravenna, the dado is a sort of mosaic of yellow and green, divided by white lines, on a red ground; and the columns and circular ribs are ornamented with zigzags, chevrons, or interlacings.

The greatest works on a white ground are the painted temples, &c. of the Egyptians, but of these I can hardly form an opinion. It is difficult to judge of the effect of the colour of any object from a drawing, as the artist always gives some tinge of his own to it, and when he reduces it to a smaller scale, he is always inclined to make the colours brighter; but when we have to judge not from drawings, but from books, the task becomes impossible. The book is to pay, or at least to be published at such a price that some copies of it can be sold; and hence the question is, how can an idea be given by employing children to colour it, or by printing it with the fewest number of stones. I can but quote Champollion's words, and state what opinion I have come to from his plates, and the piece at the Crystal Palace. Champollion says—"I should like to introduce into the great Temple of Ipsamboul all those who refuse to believe in the elegant richness that painted sculpture adds to architecture; in less than a quarter of an hour, I engage that they would perspire out all their prejudices, and that their *à priori* opinions would quit them at every pore." The general arrangement of the painting (for when sculpture is painted, we can make no distinction) is very similar to that already described. There is a dado composed of the lotus or chevrons. Two or more lines of subjects, divided horizontally by ornamental bands and hieroglyphics, and vertically by hieroglyphics only; an ornamented architrave; another line of hieroglyphics, and then the large cavetto cornice and bead. The columns have their capitals painted green if consisting of foliage, but in other respects they are treated like a wall, with the dado running round them, and ornamental bands and hieroglyphics between the subjects. What the effect may be when the interior of one of these temples is lit up by the golden reflection of a burning sun can only be described by one who has seen it; but judging of it as we can, though there are some harmonies of blue and green, and white, purple and green, yet the ochreous yellow and the prevalence of black lines, give it rather a coarse appearance.

In Italy there are very few instances of the white ground; the sacristy and the crypt of the Arena Chapel at Padua are examples—both are whitewashed. At the springing of the vault there is a broad band of blue and green ornament on a red and black ground; the vault is powdered with large red and green stars alternately; the groin point (it is a Roman groin) is painted with a wide green stripe, then a yellow one on each side, and then a red. I think that painting on a white ground was never used in Italy until about 1400, except from motives of economy.

Sta. Anastasia at Verona is the only perfect specimen I know in Italy of decoration on a white ground; and although from some of its ornaments I should judge it to be German work of the 15th century, some of the ornaments have the character of a much earlier date, much more resembling the Norman ornament of France and England. The effect is very good, and is principally got by red and green. The floor is paved with red, black and white marble, in scales; the columns of the nave and the pilasters of the clerestory are in bands of red and white marble; the arches round the windows and the wall and arch ribs consist of seven courses of red bricks and an equal space of white; above the nave arches are two lines of green scroll ornament, separated by a white space with a green line on it. The vaulting has a circle in each triangular compartment, containing a head surrounded by green foliage, or a line forming a geometrical pattern, and at the side of the ribs there is a red scroll on a black ground, resembling in character that between the balls in the arch rib at Ernée; the ribs of the transepts are half painted in bars or chevrons. In fact, this, like most of the French churches, is only a system of half painting, but a more perfect and agreeable specimen.

The painting of Norman churches was not confined to half painting or mere ornament, but the walls and vaults were covered with subjects; the most celebrated one in France is St. Savin in Poitou. I have not seen this church, but a Norman chapel at Ernée, between Mayenne and Laval, has the ribs painted with zigzags and pateras; the vaulting is white, with red rustics and red flowers, and the half-dome of the apse is divided into three compartments in width; in the centre is a vesica piscis enclosing the figure of Christ; at the corners, outside the vesica, are angels; the sides are divided into two panels in height; the lower panels contain on one side St. Benedict, on the other side a Bishop, with an angel above each of them; and in the semi-circle left at the top is a Norman tree. It is worthy of remark as to the painting of that date, that the Bayeux tapestry is on a white ground outlined in black.

Benozzo Gozzoli, and the painters about his time, used a white ground for the purpose of getting more relief to their figures. The arrangement is the same as on the blue ground; the ornamental borders generally have angels or cupids supporting a wreath, containing a saint's head, and different coloured foliage on a coloured ground. The general tone of the pictures is a pale greenish grey.

In general painted sculpture only differs from painting by its having greater durability; but the sculpture of the Alhambra would have been an expensive folly without its painting, and its painting would lose more than half its value were it not applied to delicately-subordinated surfaces. All the leading patterns are traced out on one surface in gold; the minor patterns are on a second or third surface, and are either in gold or white. The background (if background we can call it) is red and blue. The grey effect is got, in the same way that a miniature painter gets it, by stippling; all the colours are minutely divided; the red or deep blue only tells in little spots, the rest being shaded off by the projections. The patterns are most wonderfully managed; the main gold lines are not an inch broad; the subordinate ones are cut into hollows with ball flowers in them, all the cut parts being red, so as really not to present more than from one-eighth to one-sixteenth of an inch of gold, and the white lines which form patterns rarely exceed one quarter of an inch, the rest being covered with fine blue ornament; in the subordinate ones the blue leaves only one-eighth to one-sixteenth of an inch of white. When looked at close the ornament presents an intricate appearance, with gold, blue and white running one into the other; but every different point of view brings out a fresh pattern, and in so extraordinary a manner that when looking from one side to another, we cannot believe that the ornament we are looking at close can have the effect it has at a distance; so that we are almost inclined to agree with the Moorish poet, who says—"Look attentively at my elegance, thou will reap the benefit of a commentary on decoration." I cannot refrain from expressing my gratitude to Mr. Owen Jones for having given us so lovely an example of colour. The lower chapel at Assisi, the Alhambra Court, and the stained glass of the Duomo of Florence and of Chartres Cathedral, are things which, once seen, can never be forgotten.

Pompeii also furnishes us with a commentary on decoration, but of the opposite kind to that of the Alhambra. It contains specimens of almost everything that is to be avoided in decoration; bad drawing, bad perspective, bad ornament, and bad colour. The general disposition is like an ordinary room in the present day, with frieze, cornice, and dado, and the walls in panels; in these panels we find single figures or groups, subjects, arabesques, and a fantastic kind of architecture; there are hundreds of columns, but hardly one that suggests anything elegant; all sorts of scrolls and patterns, but most of them thin and meagre in form and badly filling the spaces. Every kind of colouring has been adopted; light dados and dark friezes, dark dados and light friezes, dark and light panelling, and every sort of colour, but yet there is hardly a good bit in the place; age and the gradual operation of decay have rendered the effect more harmonious, but there is nothing which we should wish to have copied about us irrespective of the association.

Perugino must have seen some of the Pompeian work or some ancient arabesques, and must have taken from them his style of decoration. He was the last of the decorators or architectural painters, and most of his work is bad in colour; his backgrounds consist of large masses of black and red, which will not compose but resolutely stand out in their own individuality. The Sala del Cambio, at Perugia, is painted with a peculiarly unpleasant hot red on a black ground, and with colored arabesques on a gold one alternately, while the ceiling of the chapel has large patches of red; the one is too dull, and the other too glaring. Raphael, Michael Angelo, and Giulio Romano came next, and then decoration was at an end. Raphael was no doubt misled by the taste shewn for the Roman arabesques just found, and though his school of Athens shews that he could paint pictures that are agreeable as decoration, yet he was generally careless of what became of the room, so that he succeeded with his pictures: he was no doubt much influenced by Michael Angelo, whose pictures are never decoration at all. The specimens of Giulio Romano, at Rome, shew a taste for a sort of hot red that would render any room positively unpleasant to live in; of his decorations at Mantua I cannot speak as I have never seen them. Raphael and Michael Angelo painted pictures that are worth the spoiling of any room to receive such gems of art, but to them we must chiefly ascribe the separation of architecture and painting; they might, had they liked to sacrifice a little of their force and projection, have made their pictures both inseparable from the rooms and charming as compositions of colour.

I suppose in the present day we can hardly expect artists to paint on a blue or gold ground (of course I am speaking now of wall painting), as they would lose too much of that roundness and depth which they so much aim at; but until they will take a Chinese plate with a pale green or white ground as a pattern, and propose to themselves telling their story, and trusting only to beauty of form and lovely tender colours, wall painting will never be popular in England; for very few rooms can afford to have three-fourths of the light absorbed by black backgrounds and dark broken tones of blue and red.

I originally proposed to consider the way in which colour has been applied to exteriors and statues, to stained glass, enamels, and stuffs, but fear I have already almost exhausted your patience. and my task would be very imperfectly done if I were not to endeavour to draw some deductions from the different specimens of decoration which we have been considering. The colourist like the poet is born and not made; yet as so many more persons are concerned in applying colour as an art than in writing poetry, it is of more consequence that we should up to a certain point have the power of making colourists than poets. Art I imagine to be a science of which the laws are not known, and consequently the colourist is one who works intuitively; but as science is only to be discovered by observing a large number of facts, I have endeavoured to make what observations I could upon the beautiful in colour; others have done and will do the same, and when sufficient examples have been collected, some philosopher will deduce the laws.

I shall spare you a recital of the technical terms of colour, of Field's chromatic equivalents,[*] and

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[*] It appears to me to be extraordinary that this question of the chromatic equivalents has never really been set at rest, as it would be easy to ascertain the relative areas that the red and green, blue and orange, and yellow and violet rays occupy, which when combined reproduce white light; and although, optically speaking, the green, orange, and violet rays are not secondary colours (that is, they cannot be formed by the mixture of the blue and yellow, &c.) yet for the purposes of art, the experiment must be much more conclusive than the rough experiments of Field, which even he did not consider absolutely conclusive.

Chevreul's laws of contrast, and enter at once upon the subject of the harmonies. In nature every colour may be found in juxta-position with every other, and with an harmonious result, but when we come to analyse the means by which it is produced, the subtleties of the method baffle our investigation; the sculptured surface with its light and shade, the texture, the infinity of tints and colours, all making up one, render all our attempts at perfect imitation or comprehension impossible; still as we get our impressions of what is beautiful from nature, it is to her we must go when we want to find out the reason of the harmony. The most usual harmonies in nature are those of gradation or succession. The harmony of gradation is where one colour gradually rises or falls, either from white through any colour into black (as from white through blue into black in the jay's wing), or from a pale tint of a colour to its darkest shade, yet never going out of the normal scale; the harmony of succession is where green passes into yellow or blue, yellow into orange or green, violet into red or blue, red into orange or violet; or where the whole prismatic scale is used up, and we begin at one colour, and gradually pass through the whole seven. Next in frequency to these come the harmonies of contrast, that is, the harmonies of the complimentary colours; and lastly, the alternate harmonies in which red with blue is the worst, and red with yellow not much better; the agreeable ones are orange and green, yellow and blue, green and violet,—we have in addition to these the harmonies of colours with white and black: with white, yellow, green and blue are the most common; with black, the best are crimson, scarlet, orange, and bright emerald green, not the green of the paint but the green of the jewel. There are many brilliant and delightful harmonies with the secondaries and the tertiaries and black; thus we have citron, olive, and russet in metallic colours, with black, in the Honduras turkey, and russet, violet, green citron, green and black, green, violet, green russet, green and black, in the peacock. Of the harmonies of tone, those to my eye are most agreeable that are not contrasting; black and white, and the tender pale colours and black, do not appear to me to be agreeable when in large masses. One of the laws laid down by the Educational Committee is, that when a primary and secondary are in harmony, if we give any hue to the primary, the secondary must be tinged with the remaining primary. Thus if red and green are in harmony, as we make the red more violet we must make the green more yellow; as a rule the very reverse takes place in flowers, for as the flower gets more violet the leaves get more olive; thus the scarlet geranium has leaves of a bright yellow green, slightly broken with red or brown, while such flowers as the purple dragon's tongue have dark olive green leaves; this may possibly be to ensure the contrast of tone which almost always takes place in flowers. When colour is applied to sculptured forms, it should as a rule always contrast with the form, and not follow it, as we see in the legs and tails of animals, where the pattern generally takes the form of rings or chevrons, and not of longitudinal stripes. We see then that in any system of colouring we want to associate as a whole such masses of complementary colours as nearly combine to form white light, and leave only that pale red, yellow, green, or grey residuary tinge we may require, and to choose such of the harmonies as we prefer; but we must in our present state of science trust entirely to the correctness of the eye for making the two colours that are to be together really harmonious.

In conclusion I will submit a few deductions derived from the colouring of the works we have reviewed. On a *gold ground*, black and white should be used like jewels in very small pieces, or as lines of separation, otherwise they will destroy the harmony of the composition. The predominant coloured surfaces should not be deeper in tone than the gold ground, and those that are of a very pale tint, nearly approaching to white, appear the most beautiful. The harmonies at St. Mark's appear to be green and red, green and blue, green and violet; but there are other peculiarities to be noticed, as the lovely bead ornament in the Atrium consisting of eight-leaved flowers on a gold ground, each flower having four blue and four red leaves, and four green and four red alternately, the colours separated from the gold and each other by white; and the beautiful zig-zag border to a portrait on one of the pendentives of the Atrium, in which pale green, gold, pale blue, white, grouped on one side of the indent, and green, red, blue, white, on the other, are found on a black ground. On the *blue ground* the divisions are almost always effected by white lines, but the prevalence of masses of white or black destroys the effect. The harmonies here include nearly every one, but the commonest and best are those in which the green foliage makes a harmony of contrast on one side with the red, and an analagous harmony on the other with the blue. We have orange between blue and red, orange and green, orange and pink, black and green, orange and black, blue and violet. On a *white ground* any colour that is much darker in tone will make a division, and the only thing to be considered is the application of the colours themselves. These must be of sufficiently pale tint not to form violent contrasts of tone. The only exception to this rule is when colours are employed in minute portions; in which case the surrounding white will sufficiently lower them in tone to make them agreeable. But my advice to any one about to paint on a white ground, is to possess himself of one of the best kind of china plates. For the system of stippling the work of India is the one to be studied; in fact, for every thing connected with ornament or colour, it cannot be studied too much. A few square inches of an Indian shawl form the most perfect master we can procure; and were I to describe the piece I have copied, which is hanging on the wall, I might have given a commentary on decoration in a small space. I must now conclude. Though no one can be so fully aware of this imperfect accomplishment of a very difficult task as myself, yet the short time I have had to devote to it must be my excuse for its length and its shortcomings. But as it is the subject of all others that I most delight in, it is from no want of will that it is not perfect. I only trust that some one more able than myself will take the subject in hand, and elucidate those laws which are at present but matters of feeling or taste.

Mr. Burges, Visitor, said he could add very little information to that given in Mr. Aitchison's excellent paper. His own studies had been mainly confined to Mediæval and Pompeian buildings. He thought the Pompeian colouring very agreeable, though rather forcible; but the natives of hot climates required strong colours, because their buildings could only have small windows for the admission of light. With regard to Mediæval colouring, Mr. Aitchison had referred to it in connection with the blue, the gold, and the white ground respectively, but he (Mr. Burges) thought that an architect would rather divide it into two classes, the finished and the unfinished. When a cathedral was built they put stained glass in the windows, and obtained colour by that means. There was so little wall space that there was no room for pictures. The consequence of this was, they left it white, each of the piers being exceedingly small, and then they continued the colours of the windows by picking out the hollows of the principal mouldings with red, the only parts strongly decorated being the bosses and the mouldings of the ribs, for about one foot from them. This system was found at Chartres, Beauvais and Ely. Occasionally, but not very often, the capitals were coloured and gilt. as at Cologne; where, however, they adopted strong colouring, as at the Ste. Chapelle, and coloured the space between the windows, the effect was exceedingly bad. As regarded coloured decorations, he thought the Ste. Chapelle was exceedingly bad, and that it would not bear comparison with the Lower Chapel at Assisi. The western and southern systems could not go together. If we wanted colouring in a building, we must give up the mouldings, or *vice versâ*: for his own part, he would always give up the mouldings. In the case of the chapter-houses at Salisbury and Ely, they went further than in the cathedrals. At Salisbury they gave very little colour to the glass. It was nearly all grisaille. They then coloured the hollows of the mouldings, and richly decorated the bosses and the space immediately surrounding them on the vaulting; the rest of the vaulting being covered with red lines in imitation of stone joints, a very common system of decoration in the lower coloured buildings of the Middle Ages. On one occasion he was in the little church of Mollinet, near Rouen, and found that it was almost in the same state it was in during the Middle Ages, and that nearly every square inch of it was covered with some decorative pattern. In the case of Salisbury Chapter-House, the colour was gradually brought down from the bosses by means of a little white, red, or yellow on the ribs, until it reached the windows. These had the circles in the tracery, and a band of shields running along horizontally through all the lights, in full lined rich-coloured glass. The borders continued this colour to the bottom of the windows, where the arcade round the whole of the building was most richly and fully decorated. It was the same in the Lady Chapel at Ely. They brought the colour carefully down; the windows were all of stained glass, with a far greater proportion of white and yellow in them than at the Sainte Chapelle; the effect of which latter he could not help thinking decidedly bad. In Italy, if they wanted colour in a church, they used Mr. Aitchison's blue ground, and separated the pictures by borders with a thin white line on either side; for it was these white lines, and not the borders, that made the real line of separation. On the other hand, they took care not to deaden the effect by mixing white with it. It was pure good blue, and upon it they painted in tender colours, such as light pink and light red, and white, shaded with different tones of blue and red; and sometimes they even used a scarlet figure to vary the effect. At other times they used a beautiful light purple, which was a great favourite with the artists of the Middle Ages: all these colours were to be seen in perfection in Van Eyck's picture of the Adoration of the Lamb. When they used gold grounds, as at Palermo, they still used light colours, but separated by means of darker ones, only in much smaller proportions. After all, the effect of a building would depend a great deal upon the light. The Upper Chapel at Assisi looked nearly as bad as the Ste. Chapelle, because there was too much light in it; on the contrary, one of the reasons for the Lower Chapel looking so beautiful was, that the light only penetrated into it through the windows of the side chapels. It was not for him to attack M. Chevreul, or to say he did not think he had an eye for colour; but, in his own opinion, all that was known of colour was derived from nature. He had himself taken all the pains he could to study the colours of flowers, birds and butterflies, and he had endeavoured to make out a law on the subject; and if he had discovered any law of harmony in colouring, he should only be too happy to state it; but this was not the case. As to the future of architecture, in regard to the decoration of buildings, we must have figures and employ the painter, for all decorations without figures always appeared to him to be exceedingly tame. We must get the painter to treat the building as an architect would, and put an architect over him to look after him; but it would be better still, although we might have to wait for two or three generations, if architects turned painters themselves. Let them erect the building, and then decorate and paint it, and so leave a thoroughly perfect good work behind them.

Mr. Penrose, Fellow, observed that in the present state of polychromatic knowledge it would be wrong to lay down too many dogmatic laws. A few, it was true, might be laid down; such as the advantage in most cases of separating strong colours by delicate white or other lines, and that the combination of certain colours will produce discord; but it would be dangerous to assert many points very positively; and more research and more experiments were necessary before rules could be laid down to any great extent. At present many persons were deterred from the subject by an apprehension of its great difficulty, whereas he thought that the study of colour in landscapes, flowers, birds, butterflies, &c. would do more than a great deal of scientific inquiry. The great success of the untutored races in the application of colour must point out the study of nature as the best guide in the first instance; but as commentaries on the book of nature the great works of art of antiquity were of great importance. The key in which a building should be coloured depended very much upon its purpose. In some cases a white ground, or one so nearly white as not to be crude, was the best; in other cases, where only a moderate light was admitted, deep blues and reds were best. He had been led to think that in all cases where deep colours were employed, the more they were in the shade the better;—always however excepting mosaic, which, from the transparency of its coloured ground, and the reflections, enabled it to bear more light than any other kind of coloured decoration; but the effect even of this was impaired by a very strong light, as was shewn in a tribune exposed to the south near the Lateran at Rome, where the effect was glaring and inharmonious.

Mr. **Lockyer**, Associate, said that the mosaic referred to was a modern specimen; but in the façade of Orvieto Cathedral the effect was very different, the figures having the appearance of floating in a sea of gold. The mosaics at Sienna were modern.

Mr. **Penrose** repeated that he had made an exception as to mosaic, which was indeed the only form in which brilliant colouring would bear a strong light. While he agreed with much that Mr. Aitchison had said, he differed in that he considered the later mosaics in the sacristy of St Mark's, Venice, in all respects equal to, and in some points more beautiful, than those of the earlier period.

Mr. A. J. **Baker**, Associate, said that one of the most important laws of the arrangement of coloured decorations received much less attention than it deserved—he alluded to the juxta position of light and dark colours, "the chiaro-oscuro," as it was called by painters. If the most harmonious series of colours were arranged together without a variety of depth the effect was tame, and the outlines viewed at a distance became blended into a confused mass; but if due attention were paid to strength as well as to harmony of colours the composition became most satisfactory. Examination of the best examples would at once prove the importance of this law. In some of the finest of the Italian designs the strongest colours were the blue and maroon, at a distance they caught the eye as dark masses; red was the intermediate tone with pale green and yellow, the lightest forming the bright part of the pattern.* Other beautiful examples might be investigated with a similar result, but it was unnecessary to bring further evidence.

Mr. **Fowler**, Fellow, referred to the discovery, some fifty years ago, of some paintings on the walls of the church of the parish in which he then lived, which shewed that the entire building, mouldings and all, had been coloured, and that it was originally a specimen of the richest kind of polychromatic decoration, of the time of Henry VII. From some feeling, however, that these works were connected with Popish superstition, the vicar of the parish had them all covered up again. The paintings had excited much astonishment and admiration at the time, but he only referred to them now as a matter of history, and to contrast the feeling of architects and antiquaries at present in reference to such subjects with the state of feeling which then prevailed. He had himself always felt that this was a branch of their art which demanded much more study than it had received; and he was very glad to see it taken up as it had lately been. With regard to the Sainte Chapelle the architect deserved great credit for working out a great and striking experiment in a most elaborate manner; and its existence, as a matter for speculation and criticism, was at all events a gratifying circumstance. He himself agreed with those who considered that it was overdone. The great requisite in coloured decoration was to mark and bring out in their integrity the columns and other structural parts. The illustrations of the Cathedral of Monreale, at Palermo, by the late M. Zanth, appeared to shew that building was one of the most successful instances of polychromatic decoration, and it was peculiarly interesting as having been executed at a time when the art was better understood than at present.

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* The elegant coloured patterns on Indian shawls depend in a great measure for their beauty on the brilliancy and harmony of the colours, but these are so divided by white or yellow lines as to produce a slight effect of light and shade. But so slightly is this effect produced that at some distance the colours fuse into a pale brown tint, and the pattern is but feebly marked by the white lines. For this reason, beautiful as these patterns are, they should be employed only on small surfaces, where the eye can take them in at a glance; in the shawls they appear to most advantage when contrasted with masses of simple red or green.—A. J. B.

Mr. Lockyer said that he had no doubt the subject had been a matter of deep study to Mr. Aitchison, and it was one which should not be too lightly discussed; but he could not help dissenting from that gentleman's views with regard to the Pompeian decorations, and the works of Giulio Romano. Any one who had seen the works of the last-named artist at Mantua, at the Villa Madama, and at the Villa di Papa Giulio, must have felt that he was a thorough master of his art; and, although his own taste might be questioned, he must confess that he had been more struck by the works of Giulio Romano than by those of any other Italian artist of that period. Mr. Aitchison objected to his masses of deep red, but in the Italian climate such colouring was required more than in England. Mr. Aitchison had also mentioned that gold had a better effect on a green ground. In Italy the gold which coated the mosaics was chiefly used on glass of a red colour.

Mr. M. D. Wyatt. The glass, of which the gilded mosaic of Sta. Sophia was made, was white and clear, at a later period it became green and partially opaque as at St. Mark's, and ultimately and up to the present time it has been made of a deep red and opaque tint.

Mr. Lockyer assented. There were indeed very few examples on green, and the effect in one case (at San Lorenzo) was very poor. The mosaics at St. Mark's, Venice, were relieved, as Mr. Aitchison observed, with black lines; but this was not always the case, as there was very little black in the beautiful room in the Palace at Palermo, where the decoration consisted of delicate tints on a rich gold ground. The mosaics at Monreale were being modernized and repaired by a school of mosaicists which the King of Naples had established there.

Mr. Kerr, Fellow, understood Mr. Aitchison to say, that the art of colour was a matter of instinct and not of rule; that it was not a matter of science but of intuitive and instinctive knowledge, under the correction of an experienced eye. Now, nothing, in his opinion, could be a greater mistake in the abstract. If he were called upon to define colour in relation to architecture, he should say it was the music of their art. Nothing could be more correctly weighed, estimated, or definitively reduced into system. Not that he would say that it had been so weighed and estimated, and its elements accurately reduced into system; but the work of Chevreul on the subject was exceedingly mathematical in all its processes for the determination of principles on which every one might very safely rely. The interior decoration of a building in modern times with colour must be a peculiarly interesting subject of inquiry to the architect. When he spoke of colour as being the music of their art, he was not speaking altogether figuratively, for he fancied that the interior of a building might be decorated in any one of many ways, just in the same manner as a piece of music might be set to any one or many expressions or sentiments. When we wished to decorate the interior of a structure in a bold and striking manner, or on the other hand, to carry out the work in a smooth and graceful one, we adopted the desired material and design in order to produce the wished-for effect. In the classical times of antiquity, he was inclined to think—notwithstanding all that had been said, and perhaps proved, with regard to chromatic decorative building—that it was not carried on to a very great extent. He, for one, as an admirer of Greek architecture, should be sorry to admit that they did colour the exterior of their buildings. The operation of the mind at that time and in that age was more stern and severe; but when we came to the Middle Ages, we found the mind losing its severity —losing that sternness, and more involved in complication of lighter details; and then in aftertimes, and by gradual progression, the use of colour became more applicable to the purposes of art, and in the Mediæval and Renaissance works (which were governed in principle almost entirely by Mediæval examples), we found that colour began to be adopted and used, not only with profusion, but with something more than gusto—with intuitive success. Now, the colouring that was to be found in Mediæval buildings, successful as it was, was not successful by accident, or by the application of rules, but the existence of rules might be easily discovered. Chevreul discovered a great many, and laid down remarks on position. If Mr. Aitchison would only collect the specimens that were hanging on the walls, and assort them in various classes, he would find that certain principles governed one class and certain principles another; which must inevitably be, and without which colour decoration could not be successfully employed. It was different with form, the other great principle and department of their art. They could not weigh form, but they could, as it were, weigh the music and poetry of colour, and so lay down fixed principles of action. Indeed, there was no subject in the present day more deserving the attention of scientific men in relation to architecture than colour.

Mr. Donaldson, H. S. F. C., said that the one great principle, which should guide an architect with regard to decoration, should be to express a defined purpose; but it was often difficult to ascertain the intention of the kind of decoration which was adopted. The architect should always take the leading position in a building, and all decoration should be subservient to the architecture, and calculated to give effect, by contrast, to the various constructive features. Mr. Burges had well observed that in Mediæval edifices the colour was applied in the hollows, so as to throw out with more effect the smaller mouldings and columns. Where, however, colour was made to usurp the place of architecture, and so applied as to make one building material represent another, architecture held only a secondary and degrading position. Architecture might be appropriately decorated by the use of differently-coloured marbles, of which the friezes and other parts might be constructed; but there should be no artificial or imitative decoration. Colour should not represent architecture, but architectural decoration. He could not conceive the object of covering the beautiful architecture of the Sainte Chapelle at Paris with an artificial coat of colouring, and the same objection applied to St. Stephen's Chapel, Westminster, the walls of which (as shewn by a drawing which he had seen some forty years ago) were covered with colour and gilding, most harmoniously blended, but resembling tapestry hangings, and destroying the effect of the architecture. He differed from Mr. Aitchison with regard to the paintings at Pompeii, which, as they were in shade rather than exposed to the sun, were exceedingly harmonious; and the forms of which, presenting as they did small columns, diminutive entablatures, fantastic doors, and other capricious decorations, represented a class of domestic architecture then existing, but of which there were now no remains. Similar forms might easily be reproduced in iron; and executed in bronze, as they doubtless were by the ancients, they would be very appropriate. He could not approve of the decoration of the Baths of Titus at Rome, but had been much pleased with the villas near Rome, represented in the work of Mr. Gruner, particularly with some paintings on a white ground, the colouring being in fact more brilliant than the peacock's tail referred to by Mr. Aitchison. The remains in the British Museum shewed that the Egyptians knew the value of the white line. With regard to Giulio Romano, he thought his works at the Palazzo del T generally puerile, and a caprice or exaggeration rather than an effort of genius. At the Villa Giulia there were many works of Vignola as well as of Giulio

Romano, and it was necessary that the works of these masters should not be confounded. Mr. Donaldson concluded by moving a vote of thanks to Mr. Aitchison.

Mr. AITCHISON said that he had wished to avoid expressing any prejudice against or partiality for particular styles. He had been guided by his own eye in studying coloured decoration, and had endeavoured not to be led by the opinions of others. He now found two objections made to his remarks;—one, that he had not studied nature,—the other, that he had not studied art—but he had read nearly every book on the subject from Hayter's ultimatum down to Chevreul. With regard to Monsieur Chevreul's book, he had studied it with care, but thought there was nothing like mathematical demonstration in it. All indeed that had been shewn by that author was, that when two tones of the same colour were put together, the light appeared lighter, and the dark darker, and that when *two colours* were put together, each was tinged with the complimentary of the other; but as to harmony M. Chevreul had, in fact, taken certain colours, and those which he found agreeable to his own eye he called harmonious. With regard to nature, he (Mr. Aitchison) had studied the common flowers which had fallen in his way, and such birds and butterflies as were to be seen at the British Museum and the Zoological Gardens; and the harmonies of the mosaics of St. Mark's were exactly those which were continually found in nature. It was somewhat difficult to judge of the paintings of Pompeii, and it was some time since he had been there; but in almost every case he remembered the effect was spoiled by large masses of white or black being used with colours in their full intensity, and as to harmony, although there were some good ones of violet grey and yellow, and green and black, yet there was a great preponderance of yellow and red, and of red and blue in the panels. With regard to Giulio Romano, he was said to have painted the "History of Psyche," in the Farnesina at Rome, the colour of which he (Mr. Aitchison) thought horrible; and many of his friends agreed with him. The works of this artist were fanciful pieces of ornament, some of them in beautiful harmony, but bad in point of composition, and (as was the case with Perugino and others) while they might be beautiful in small pictures, they were not successful as decorations for an entire building. In the sacristy of St. Mark's gold and white were employed almost exclusively, it was therefore hardly an example of colouring. He had alluded to the old figure subjects over one of the doors, which, when seen from the other side of the Piazza, were of a pale beautiful green tinge; the other he referred to was a sixteenth century one with a great mass of blue drapery, which some admired, but which he did not. Mr. Baker had remarked that colours could not be agreeable unless they were contrasted in tone, but the Hindoos and Chinese generally used the colours in their normal purity. The Indian shawl pattern which he produced was only one of £ 600,000. worth imported every half year. The red, blue and green in this example were almost exactly of the same tone, but most carefully massed and shaded off. The inability to distinguish colours was one of the commonest forms of colour blindness; for many people could tell the difference of tone but not of colour. Upon the general question whether painting should be applied to architecture, he had to contend with the prejudices which had grown up with people from their youth; but in taking nature as their guide, it was found that all kinds of animals and birds were coloured and covered with most beautiful patterns. In shells, too, colour was applied not so as to bring out the form, but to contrast with it often in lines passing at right angles with those of the shell itself; and the same remark applied to birds and fishes. Even the legs and tails of animals were covered with rings, or chevrons, and not striped in the direction of the limb.

The vote of thanks was carried unanimously, and the meeting adjourned.

A FEW OBSERVATIONS ON THE EARLY HABITATIONS OF THE IRISH, AND ESPECIALLY THE CRANNOGES OR LAKE CASTLES.

By M. Digby Wyatt, Hon. Sec.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, January 11th, 1858.

With the prospect before the meeting of the interesting paper on the round towers of Ireland, promised us by Mr. Hills, I feel that some apology is due for the few remarks I purpose bringing under your attention. I find the materials for that apology ready to my hand in three facts,—firstly, that this evening we receive as a present from its author, Mr. W. R. Wilde, Hon. Sec. for Foreign Correspondence to the Royal Irish Academy, one of the most important contributions which has yet been made to the complete illustration of the early art and ethnography of the sister island,—secondly, that we have been favoured by the Royal Irish Academy with the loan of some very careful drawings of the most interesting class of Celtic monuments, which have been recently brought to light,—and thirdly, that you may be better enabled to judge of the probability of the theories originated by Ledwich, O'Brien, Vallancey, Petrie and others, which will no doubt be brought under your notice by Mr. Hills, if you are at no great sacrifice of time, made acquainted with some of the most curious vestiges which remain of the domestic monuments erected by the primæval race, to whom, or to whose descendants, we are no doubt indebted for the round towers themselves, and the curious remains generally found in their immediate vicinity.

It may possibly be objected that the interest associated with the Celtic monuments of the early occupation and Christianity of Ireland is of an Archæological nature alone,—a very little examination will remove this prejudice.

One who has paid profound attention to the peculiar types of Celtic design, Mr. J. O. Westwood, thus expresses himself on the subject in Mr. Owen Jones' Grammar of Ornament:—"Even supposing the early artists of these Islands might have obtained the germs of their peculiar styles of ornament from some other source than their own natural genius, they had between the period of the introduction of Christianity (possibly in the fourth and certainly in the fifth centuries), and the beginning of the eighth century, formed several very distinct systems of ornamentation, perfectly unlike in their developed state, those of any other country; and this too, at a period when nearly the whole of Europe, owing to the breaking up of the great Roman Empire, was involved in almost complete darkness as regards artistic productions."

Surely it can be no unprofitable or uninteresting task for us as architects, to examine into the domestic as well as the ecclesiastical structures, which were reared by these singularly original artists. It is no exaggeration to state that the soil of Ireland still teems with historical relics of a monumental character, to record the precise positions of which, it is a great gratification to find, has been made a labour of love in the preparation of the excellent Irish Ordnance Survey. The Museum of the Royal Irish Academy vies in its illustration of ancient Celtic life and art, with the position occupied by that of Copenhagen, in reference to all that is most interesting and instructive in Scandinavian; while Mr. Wilde as a learned and popular teacher rivals in his catalogue the ability and enthusiasm of the well-known Worsaae, whose essays on northern Archæology are full of interesting information.

Some of the rude structures to which I purpose very briefly drawing your attention, were no doubt inhabited by those noble youths whose mission it was to evangelize, first, those portions of their own Island which still adhered to Paganism, and subsequently many other countries of Europe. Among the earliest of such "societies for the propagation of the gospel in foreign parts," were the bands who carried the cross to the regions of the North, and with it took those singular types of ornament which were slowly adopted by the Scandinavian artists during the tenth and eleventh centuries. The monks of Iona, under the great Irish Saint and Scribe, Columba or Columbkill, and their Anglo-Saxon disciples at Lindisfarne, under his friend St. Aidan, together with the Irish monks at Glastonbury, spread Celtic ornament in England, from which it had to a great extent retired with the expulsion of the Ancient British. St. Boniface, the principal awakener of Germany to Christianity, carried with him his singularly ornamented book of Gospels, which is still preserved as a relic at Fulda. Similar evidence of the transmission of the art prevalent during the early centuries of the Church in Ireland, to other lands by means of the Missionaries who left her shores, is to be found in the books of St. Kilian, the apostle of Franconia, still preserved at Wurtzburg, in those of St. Gall, now in the public library of St. Gall, in the Canton of Switzerland, which still bears his name, and in the very important series connected with the Monastic Institution founded by St. Columbanus, at Bobbio, in Italy; of which last, Muratori has given an interesting catalogue. Many of these saints were themselves scribes, and their autograph copies of the Holy Gospels are still in existence, with the name of the writers in some cases, identifying the volumes and absolutely fixing their date. Thus we have the Gospels of St. Columba, the Leabhar Dhimma, or Gospels of St. Dhimma Mac Nathi, and the Mac Regol Gospels in the Bodleian Library. All of these are anterior to the ninth century, and are distinguished by an elaborate style of ornament, unlike any other European type. In delicacy of handling, and minuteness of faultless execution, the whole range of paleography offers nothing comparable to the early Irish and British manuscripts. When in Dublin, some years ago, I had the opportunity of studying very carefully the most marvellous of all, "The Book of Kells," some of the ornaments of which I attempted to copy, but broke down in despair. Of this very book Mr. Westwood examined the pages, as I did, for hours together without ever detecting a false line, or an irregular interlacement. In one space of about a quarter of an inch superficial he counted, with a magnifying glass, no less than one hundred and fifty-eight interlacements of a slender ribbon pattern, formed of white lines, edged by black ones, upon a black ground. No wonder that tradition should allege that these unerring lines should have been traced by angels. The careful student of Carlovingian design, cannot fail to trace in much that was done by the great Emperor of the Franks, the influence of the Celtic sages who were nearest to his person.

Despite the dignity of these Hibernian heroes from the days of Pelagius and St. Patrick in the 5th century, and the respect their Schools and Colleges acquired abroad, their habitations and those of their countrymen and cotemporaries, appear to have been of the very simplest.

Detached houses of stone were erected only at somewhat late dates—that material in early days having been reserved almost exclusively for the round towers and crosses, the small churches, and the military defences with the rude huts enclosed within them. The dwellings themselves appear to have been constructed for the most part of wood, or of wattles, with clay filling in the interstices. Remains of ancient stone and earthen forts, in which numerous habitations were included, are still frequently met with throughout Ireland; though vast numbers have no doubt been destroyed by time, and from the land having been brought more generally into cultivation. The fortresses known as Cahirs (Caer. Welch ?) or Cashils (Castles?) amongst which are Tailtin, Tlachtgha, Tara, Croghan, the Grianan of Aileach, in the county of Donegal, &c. are built invariably of stone, and appear to have been the strongholds of the then numerous princes and chiefs, together with their followers:—The Hill Forts, called "Duns" or "Lisses," though occasionally formed of earth when stone was difficult to be procured, are chiefly built of the latter material, and entirely without cement; the walls often being many feet in thickness. They are generally circular, and all contain small chambers, consisting only of flat stones laid across large upright ones, and from the quantities of bones found in some of them, they appear to have been used as well to contain stores of provision as for the protection of the women and children. A few Duns have staircases formed in the inner side of the wall and leading to platforms near the top, from whence the defenders of the fort could observe, and possibly attack their assailants. "They are found commonly, observes Mr. Wakeman, in his excellent hand book of Irish Archæology, along the western and south-western coasts of Ireland, and upon the adjoining islands. They probably owe their preservation to the abundance of stone in the districts where they are generally found, the neighbouring inhabitants thus having no inducement to destroy them for the sake of their materials. A model of one may be seen in the Museum of the Royal Dublin Society House, of the Cathair at Staigue, in the County of Kerry, probably the most perfect example of its class to be met with in any part of the south of Ireland. It consists of a circular wall of uncemented stones, about 18 ft. in height, and 12 ft. in thickness, enclosing an area of 88 yards in diameter. Upon the internal face of the wall are regular flights of steps, leading to the highest part of the building. The doorway is composed of large unhewn stones, and is covered by a horizontal lintel. A ditch now nearly filled up, anciently defended the wall upon the exterior."

The earthen forts called "Raths" are chiefly, if not exclusively, to be found in the plain. Like the stone forts, their enclosures are generally circular, and in the raths these are always formed of an earthen embankment, from four to eight feet in height, which was probably strengthened by a wooden stockade upon it. In some cases these forts were rendered more difficult of attack by the addition of a ditch, which surrounded them outside the embankment.

Mr. Wakeman, who has carefully studied these singular constructions, states that "of the number of raths which he had examined, he had not in one instance known the mound to contain a chamber; but when the work consists merely of the circular enclosure, of which mention has been already made, excavations of a bee-hive form, lined with uncemented stones, and connected by passages sufficiently large to admit a man, are not unfrequently found. These chambers were probably used as places of temporary retreat, or as storehouses for corn, &c. &c.; the want of any ventilation, save that derived from the narrow external entrance, rendering them unfit for the continued habitation of man. We are not aware that any rath in the neighbourhood of Dublin contains a chamber or chambers of this kind. They are common only in the southern and western parts of Ireland; but subterraneous works, similar to those usually found in the forts of Connaught and Munster, occur in Meath, and perhaps in other Leinster counties."

Within these defences, whether of stone or earth, were usually built the huts of wood or wattle and clay, or the small stone cabins called *Cloghauns* or Clochauns, in which the people lived, the enclosures giving protection not only to them, but also to their cattle and stores, which in those days were in constant danger from robbers, beasts of prey, or the attacks of hostile tribes. It was this very sense of insecurity which no doubt led to the creation of the singular places of refuge and occupation, to which I desire to especially draw your attention this evening.

The discoveries connected with crannoges, or artificial islands, formed in the lakes, furnish the most interesting illustrations of the ancient Irish social or anti-social system, which have been brought forward since Dr. Petrie's publication of his admirable essay upon the Round Towers. It is to Mr. Wilde that the credit must be given of first bringing before the Royal Irish Academy in 1839, the particulars of one of these remarkable structures, for despite the fact that the ancient annals of the country abound in references to them from the year A.D. 848 to the commencement of the seventeenth century, it was not until the year 1839 that any one was identified and investigated. It is also singular that the one first discovered is at once the most perfect, the largest, and the one of which the earliest historical account is preserved—mention being made of it in the Codex Clarendensis, by which we find that it was inhabited more than 1000 years ago. Loch Gabhair, in which this crannoge, known as that of Lagore, or Dunshauglin, was situated, is in the county of Meath, and is said by tradition to have been one of the nine lakes which suddenly appeared in Ireland about 2000 years ago. The draining of this lake some years since left in its place a marsh or bog, in the midst of the remains of which this ancient fortress may still be seen. Like most of the strongholds of that time, it is of a circular form, and, like the greater number of these wooden islands, could only have been approached by means of a boat, a few only having had a causeway connecting them with the mainland. The Lagore crannoge is about 520 feet in circumference, being the largest which has yet been discovered, and is thus minutely described by Mr. Wilde:—"The circumference of the circle was formed by upright posts of black oak, measuring from 6 to 8 feet in height; these were mortised into beams of a similar material, laid flat upon the sand and marl beneath the bog, and nearly 16 feet below the present surface. The upright posts were held together by connecting cross-beams, and (said to be) fastened by large iron nails; parts of a second upper tier of posts were likewise found resting on the lower ones. The space thus enclosed was divided into separate compartments by septa or divisions that intersected one another in different directions; these were also formed of oaken beams, in a state of great preservation, joined together with greater accuracy than the former, and in some cases having their sides grooved or rabbitted to admit large panels, driven down between them." Some human remains were found within this crannoge, as well as large quantities of the bones of different animals, together with a great variety of weapons, ornaments, tools, querns (stones for grinding corn), &c. Some specimens of the most curious of these relics were brought to London by Lord Talbot de Malahide, and exhibited in 1849. Of one elaborate metal ornament, enriched with minute "opus Hibernicum," or glass mosaic, nearly similar to that which may be found in many Egyptian amulets, I made a careful drawing for his Lordship, from which he subsequently caused an engraving to be executed.*

The Strokestown crannoge, which is situated in Ardakillin Lough, in the county of Roscommon, differs from the fortress just described in its form, which is an irregular oval, as well as in having the addition of a stone wall to the usual fortifications of oaken piling. This wall (referring to diagrams) is in some parts raised upon piles, and was further strengthened, and the island protected from the encroachment of the surrounding water by a circle of sheetpiling: which in its turn was rendered more secure by upright oaken stockades. Upon the stones, marl, and clay of the original island are layers of bones, logs of timber, and ashes, covered to some depth by loose stones brought of course from the mainland. Upon this solid foundation stood the huts of its ancient owners, the hearthstones of which, still bearing the marks of fire, have been discovered in this as well as in nearly every crannoge which has been examined. The lake of Drumaleague, in the county of Leitrim, also contains two very singular specimens of crannoges, revealed by the success of the recent draining operations and illustrated in the drawings upon the walls.

One of the islands is 60 feet in diameter, the outer row of stakes, which in some parts is doubled or trebled, forming a *regular circle;* within which are several groups of stakes which, apparently, have been so placed for the purpose of supporting some superincumbent weight, probably that of the principal huts. On different spots on the surface of the second island were found three hearths formed of heaps of stones, and bearing the marks of fire. Spread all over the top of the island was a stratum of rough logs of alder timber, from 3 to 8 inches in diameter, all lying in the same direction, and all in a state of decay from the long-continued action of water. Under this was a layer of branches and sticks of all descriptions thrown together without regard to arrangement; these too were decayed and rotten. The stratum appeared to be of considerable depth, but the bottom was too soft to admit of its being conveniently excavated to a greater depth than 4 feet. This island is 72 feet in diameter, and is nearly circular; the stockade which forms the circle being only a single row of oaken piles. A canoe was found at what was supposed to have been the old water line; and in one part of the island, at a depth of 4 feet from the surface, a quantity of the bones of pigs, deer, and other animals were discovered. Of similar bones one crannoge yielded no less than one hundred and fifty tons.

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* Journal of the Archæological Institute. Vol. VI, page 105.

I should only weary you by dwelling upon other specimens of crannoges differing in no essential particular from those I have just described. Already, since 1839, about forty-six have been discovered in Ireland, and in one county alone (Leitrim) no less than twenty have been found. Aboriginal canoes, formed out of large trees, roughly hewn into shape in some cases by stone celts and hatchets, have been frequently found at the old water line in the immediate vicinity of the crannoges. Several are preserved in the Museum of the Royal Irish Academy. From the frequent accounts in the Irish annals of the burning of crannoges, we may infer that houses, or rather huts, were usually erected of wood upon the artificial foundations of the lake island, and well fortified to resist attack. A singular specimen of a very ancient Irish wooden hut was found in the Drumkelin bog, in the county of Donegal, in 1833. It has been figured and described by Captain W. Mudge, R.N.,* and appears to have been a square hut, 12 feet by 12 feet, on plan, and 9 feet high—divided into two stories in height, each 4 feet high. It was roughly framed in oak, which had been split, and wrought by stone tools, one of which was found lying upon the floor of the house.

An almost identical set of island forts or crannoges with the Irish ones have been found in the Swiss lakes, and are minutely described in a work by Professor Ferdinand Keller.*

In conclusion, gentlemen, I would desire to urge upon your attention, in the first place, the admirable work of Mr. Wilde, from which most of the facts I have brought under your notice this evening with respect to the crannoges, have been derived; and, in the second, the real value of Celtic art. Its connection with our country's history, its own individuality, and completeness as a style, illustrated by abundant monuments in stone, wood, metal, vitreous and ceramic materials, leather and vellum, and the fact of its growth and development at a moment when the atmosphere of art was darkened by the dust and confusion of the crash and downfall of Ancient Rome, and its influences, justify me in urging the subject upon your notice. Had these claims been duly entertained in this country as they have been in Ireland, many a monument and object now lost or destroyed might have been preserved for comparison and study, while we might have had in London a collection scarcely less valuable than that of the Royal Irish Academy in Dublin. Too long and too blindly the trustees of our so-called *British* Museum have shut their eyes, their ears, and their intelligences, to the important interests of the material monuments of national art and national antiquities.

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* Archæologia. Vol. XXVI, page 361.

A REVIEW OF THE ARCHITECTURE AND HISTORY OF THE ROUND TOWERS OF IRELAND.

By Gordon M. Hills, Esq.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, Jan. 11th, 1858.

At the present day there are very few architectural monuments in any part of the world whose former use and object are not fully understood, and even the long unsolved problem of the Pyramids of Egypt has been unravelled. It is therefore very remarkable that the purpose of the ancient Round Towers existing in our sister island should still be regarded by any one doubtful, although there has perhaps been more writing upon the subject than on any other vexed question of an architectural nature. I now submit illustrations of fifty-seven of these Round Towers, which, with five more, the least perfect remaining, will, I believe, include all that are to be found in various states, from the mere foundation or pile of loose stones to the complete building. In the examination of the towers we must include the buildings in conjunction with which they are invariably found, and to make the survey complete, we must also include those places where round towers are known to have existed. There are one hundred and twenty sites where these round towers either remain, or are reputed to have stood; my own visits have as yet extended to one hundred and four, and the inspection of the sites with reference to the authorities has shown that the number to which they are rightly assigned is somewhat less than one hundred and twenty. I propose then to see whether it is not possible from the architectural features of the buildings to arrange them in a chronological order, and to test and confirm this arrangement by historical authorities; but previously it may not be amiss to mention briefly the various opinions that have been put forth as to the origin and the use of these Irish Pillar Towers.

It was surmised in the seventeenth, and strongly contended at the end of the eighteenth century, that they were built by the Danes; but I believe it is now generally considered that these Scandinavian invaders, who held only posts on the sea side, and who are noticed in the Irish annals almost wholly for their savage and plundering habits from the year 765, their first invasion, till the great battle of Clontarf in 1013, when their power was finally broken, could not have erected structures which are spread equally over the entire island. Moreover, if the towers had been the work of this people, similar structures would be found in Britain and on the Continent where they settled, or had sway; but this we know is not the fact. In opposition to this theory it was suggested in 1772 that they were remains left by a people of fire worshippers, and that they were erected to preserve the fire of the Arch-Druids, that they were also used for making celestial observations, and for other purposes derived from Eastern worship. Within the present century this opinion has received very learned support, and it has also been supposed that they were erected as places of sepulture in pagan times. This last idea is the result of excavating the foundations of several of the towers in which remains, unquestionably human, have been found. Very precise accounts of the operations have been published, but it is difficult to discover in them anything not readily to be accounted for by the fact that everyone of the round towers is planted in a graveyard of ancient date. A living writer, Dr. Petrie, has very closely examined and dismissed the theories concerning fire worship, and no analogy whatever between these towers and existing structures now or formerly devoted to it has been established. It has also been put forth that they were anchorite columns, of early Christian date, raised in imitation of the Eastern ascetics who retired to a life of solitude in a sort of pulpit forming the top of a pillar. A somewhat similar opinion in the middle of the last century held them to have been penitential prisons, and this was adopted in 1806 by that distinguished antiquary Sir R. Colt Hoare.

Of the many able and learned writers who have advocated these opinions, it may be observed that scarcely any display a knowledge of architecture, and that they had not the advantages for the study of this branch of the subject which have since been developed. We now come to a period when the knowledge of architecture was brought to bear on the enquiry. One of the first instances is found in Bell's prize Essay on Gothic Architecture, published in 1829. Then Mr. Wilkinson's work giving some particulars of thirty-two of these edifices, and lastly the laborious and splendid work of Dr. Petrie. Dr. Petrie combats most of the theories preceding his own, and contends that the round towers had a Christian and Ecclesiastical origin, and were erected at various periods from the fifth to the thirteenth centuries, that they probably united the purposes of belfries, places of strength for the preservation of relics, sacred utensils, and valuables, and that they may have been used occasionally for beacons and watch towers. At the same time Mr. O'Brien, reasoning without architecture, attempted to establish that the towers were Priapeia or Phallic emblems of Budhist origin.

I will now proceed to speak of the general characteristics of the monuments themselves. It is admitted by the advocates, of every shade of opinion, that the towers were used in early Christian ages for belfries (some say after their original purposes were forgotten), and it is also conceded that the buildings found with them were used as churches; but a majority of the theorists have left the churches entirely out of the question. I have stated that the number of towers of which I have any information does not amount to one hundred and twenty. Of course many more must have existed in early times, and some idea of the number lost may be formed from the fact that nine have disappeared since the commencement of the eighteenth century, and that four of them were deliberately destroyed. The towers are, without exception, in immediate conjunction with other buildings standing together with them in graveyards. In the few instances in which, by lapse of time, the other buildings have disappeared, or the situation may seem to be different, it can be shewn by sound evidence that these adjuncts once existed, as in the great majority of instances we still find them.

We shall presently see what evidence there is that these adjuncts were churches from the first; but at present we will assume that they were so. Usually we have on each site one church and one tower, and at places where the churches are numerous the tower still seems to belong to one in particular. Examples are to be seen at Inniscattery, where several churches still remain, Inniscaltra, and other places, which are reported to have had the mystic number of seven churches. Again, where more than one tower exists, as at Clonmacnois (where there are two towers and eight churches, or oratories, and there were more, within a space of five and a quarter English acres), and at Glendalough, where two towers still remain, and there was, till quite recent times, a third; it is still seen that the tower belonged to one church in particular.

I have determined the position of sixty-six of the towers in respect to their adjunct churches. Of these, I find that thirty occupy a position to the N.W. of the churches, twelve are placed S.W., and of the remainder, five are or were in contact with the adjunct buildings, and in most respects so exceptional that I shall not further notice them at present; the other nineteen are placed to the West, North and South; but none that I have seen occupy an Eastern position. With the omission of the five exceptional ones, all are detached cylindrical shafts tapering upwards, but not always in the same ratio. Ardmore, Co. Waterford, has the greatest taper. The shaft is diminished at the top by two-fifths of its lower diameter; the least diminution is found in the tower of Turlough, Co. Mayo, the taper being in this case scarcely more than one-eighth. Some of the towers retain part, or the whole of their original roofs of stone, brought into a conical form by corbelling over, so as to form, when entire, as nearly as possible an equilateral triangle in section. The highest towers have not the greatest diameter. Fertagh, Co. Kilkenny, is the highest; it is 100 feet to the commencement of the roof, which, when perfect, must have raised it as nearly as possible to 111 feet, the diameter at the base is 15 feet 8 inches. Kilmacduagh, Co. Galway, the next in height, and still nearly perfect, is 96 feet 8 inches to its cornice, and 109 feet complete, it is 18 feet 6 inches in diameter. Turlough, which is only 62 feet 6 inches to the cornice, and has the roof nearly perfect, was 74 or 75 feet complete, and is 18 feet diameter. This is much below the average height of the perfect ones remaining; but there is one on Tory Island, in the Atlantic, six miles from the coast of Donegal, which is only 40 feet high to the cornice (it must have been 51 or 52 feet when complete), and is 16 feet 4 inches in diameter at the base. This is the least altitude, and it may have been adopted from the severe trials by tempests to which its peculiar situation on a solitary rocky island would expose it. Many of the towers spring from a plain plinth, which rises 2 to 3 feet above the ground, sometimes in two steps. The entrances are invariably raised considerably from the ground; that at Kilmacduagh so much so as to be seen above the walls of the ruined cathedral when viewed at a distance from the building. In this instance the height is 29 feet, usually it is not less than 10 feet. In some, entrances have been made in later times at the ground level, but they are easily to be distinguished from the original ones. The entrance always faces the church, where a church of corresponding construction is co-existent, churches of later date have been erected without regard to the facing of the tower door. The form of the entrance door has only two varieties, the semicircular arch and the flat head: the first of these is found three times in four in forty-three existing examples. All openings, both for doors and windows, have the jambs inclined so as to contract the openings at the top, but the jambs are parallel on plan *i. e.*, without any splay; many of the doorways, however, have a reveal on the inside for a door. In some cases means are provided for securing the door by a bar let into projecting stone sockets; these could only be used by persons inside the building. In one case there is provision for two bars. The hinges seem always to have had iron hooks let into the stone, but in almost every instance these hooks have been removed by violence. Of the arched doors, the dimensions of that of Glendalough, Co. Wicklow, may be taken as an example. It is 2 feet wide at the bottom, 1 foot 9½ inches at the springing, and 5 feet 8 inches high to the crown of the arch. Of the flat-headed doors, Lusk, Co. Dublin, is 2 feet 1 inch wide at the bottom, 1 foot 9½ inches at top, and 5 feet 11 high. The variation from these dimensions in other examples is very slight.

In the interior the towers were divided into stages; in a few instances there are very slight traces of these stages or floors, but usually a sailing course of stone, or a set off in the walls formed a rest for the floor. Only three or four ancient floors remain, and three of these are formed by a very flat arch or dome of rough stone grouted with mortar rising less than a foot. The fourth is made of slabs of slate, but I am not certain of its antiquity. Taking seventeen examples of perfect, or nearly perfect towers, we have six divided into eight stages, seven into seven, three into six, and one (that on Tory Island) into four. One tower, Donaghmore, Co. Meath, now imperfect, seems to have had nine stages. The ground stage, or that below the door, is sometimes filled up to the door, but I think it was never built solid so high, though it may have been solid for 3 or 4 feet above the ground. This story is generally vacant, and only one instance, Ballagh, Co. Mayo, occurs of a light in it. This is a circular hole on the outside, 6 inches diameter and splayed on the inside to 1 foot 4 inches wide, with inclined jambs 9 inches high, and a flat segmental head cut in a single stone. The second, or door stage, has in a few cases a window over the door. The other stages, except the top, have one window each, and the only rule followed seems to have been to place them at from 8 to 18 inches from the several floors; thus, from the small size of the windows, the upper part of each apartment was left almost in darkness. Instances occur occasionally in which a stage has no window. Two instances are found with eight windows in the upper stage, both of these however have been altered from their original to their present state. Among the pure examples two have six windows at the top; one has five; and all the others four, facing the cardinal points very nearly, but a distinct variation from that direction can be detected in one or two cases. The form of the window heads has three varieties, semi-circular, flat and angular, the last such as are considered in England usually, though not always, to indicate work of an age before the Norman Conquest. Sometimes a window has one of these forms on the outside, and another on the inside. When a window occurs over a door, it is the largest in the tower, and approaches the door in size, otherwise the top windows, except in one or two examples, are the largest. Those of Ardmore, which unite the arched and angular form in the heads of three of them, are 1 foot 5 inches wide at the sill, 1 foot 2 inches at the springing, and 3 feet 5 inches high to that point; the sill being 1 foot 8 inches above the floor. The fourth window is flat headed. These are fair general examples for size and position. The windows in the various intermediate stages are smaller; a window 1 foot wide at the bottom, 10 inches at the top, and 2 feet high, is a fair average, placed, as before observed, very close to the floor, with very few exceptions. In only one example is there ornament on the windows, but many of the doors are more or less decorated. The material employed is always that of the locality; in the North basaltic rock, granite, whinstone and slate; in the central districts limestone of various qualities, but always hard. The only building of oolite is Killala tower, which is constructed of a very hard dark grey stone, and stands on a rock of the same. One of the towers in Mayo is built of sandstone, although within the limestone district. In the South sandstone is the prevailing material; but towers situated amidst slate rock are built of slate, and granite is used under similar circumstances. When the native rock is not suitable for chiselled work, sandstone and granite have been introduced for the doors and windows.

The decoration of the doorways is usually of a very simple kind. Of twelve with flat heads, only two have any ornament. Lusk, one of these, has a flat band, or architrave, extending all round the face, but apparently never finished. Antrim, the other one, is hereafter described. Most of the others have wrought masonry, but the beds are not parallel, and the stones are curiously notched and fitted together; others consist of rudely hammered stones. The walls of the towers are 3 feet 6 inches to 4 feet 6 inches thick, and it is not uncommon to find the jamb-stones of the same thickness. The head and sill are frequently in one thorough stone, six or seven feet in length, and of proportionate thickness. Of thirty-two arched doorways, sixteen are without ornament; of the others, four have plain flat architraves all round. One (Kells, Meath) differs only in having had a human face in relief on one jamb, and a small block left for carving on the other; another, Monasterboice, Co. Louth, has the centre of this band architrave sunk out, the sinking stopped at the springings and the centre of the arch, which is constructed with horizontal instead of radiating joints. Aghavuller, Co. Kilkenny, has the band relieved by a single groove near the outer edge of the face. Cashel has a plain architrave on the face, and a plain blocking impost running through the doorway at the springings. O'Ruark's Tower at Clonmacnois, King's County, has an impost and not an architrave. The first approach to enrichment is in the very well wrought doorway of Rattoo, Co. Kerry, which has a plain architrave, and a curious scroll in very low relief over the head. Donaghmore, Meath, is one on which the advocates of a Christian origin have greatly relied for support; it has a band architrave, with a bead on each edge, and is remarkable for the sculpture of the Crucifixion on the keystone, with a human head on each jamb. There is a total of ten of this class of architrave with the round arch as compared with one example only of the flat head. The remaining five ornamented doorways are at Antrim, Dysart, Kildare, Timahoe, and Ardmore. Antrim is one of the quadrangular doorways, and only remarkable for the cross in relief over the head, which, from its style of execution, is evidently coeval with the tower. The latter is built of basaltic rock, but the doorway is made of large blocks of porphyry well wrought. Dysart, Co. Limerick, has a band architrave projecting four inches instead of only one, it is moulded except the sill; the head is further enriched with pellets, or spherical ornaments in the centre of the moulding. This tower is of limestone, but the doorway is of a red sandstone of inferior quality, and it has suffered greatly from time and violence. Kildare and Timahoe are remarkably enriched with zig-zag and sculpture in very low relief; the capitals and bases of the jamb shafts are very singular in design. Timahoe (Queen's County) is quite perfect, but Kildare has been greatly mutilated externally; it retains, however, a peculiar feature in the remains of a gable canopy over the head of the doorway outside, and which is unquestionably original; both are constructed of sandstone, which also enters largely into the construction of both the towers. The last to be noticed is the doorway of Ardmore, which has merely a large bead on the angle of the head and jambs, and a flat projection on the face of the sill, in which it has been supposed that the two channels were caused by the wear of bell-ropes passed out of the doorway, and pulled from the ground; but I believe they are marks made by placing a ladder against the tower as an access to the door. This tower is remarkable for three string courses of torus moulding, which are placed without relation to the divisions of the internal stages; the apex is shown in several prints of the last century, with a cross or finial upon it; whatever it was, it has disappeared. The material is a very good sandstone, wrought in regular ashlar, and in very good condition. Another singularity is that in several of the stages, which in most other towers are furnished with one or more rude projecting corbels, placed quite irregularly, the corbels are variously sculptured. The whole of the interior is as carefully finished as the exterior.

Another tower to be specially noticed is Devenish. The doorway has been already included in the four with plain banded architraves; on the apex is a stone of a swelling shape, as if it were the base of a finial, and I have seen it described as possessing at one time an ornament likened to a crescent, which was doubtless an imperfect finial. At the base of the conical roof, where in all the other towers there is a plain projecting blocking or sailing course, there is a richly wrought band with four human faces. It is impossible to speak too highly of the execution of the masonry of this tower; it is wholly in sandstone, of an exceedingly rich and warm colour, and although the beds and joints are not parallel, and the courses are consequently irregular, the whole is fitted together with the greatest accuracy. The Tower of Swords, Co. Dublin, still retains at its summit a small plain stone cross, but not the original finial. About eighty years ago the tower was very injudiciously repaired, and the present cross erected, but the old one taken down, of which it appears to be the counterpart, is pointed out at the head of a grave in the churchyard. I have elsewhere seen at the foot of a tower the summit stone of the fallen roof, morticed to receive a finial. To conclude the detail of the towers we have only to notice Kinneh, Co. Cork, which is hexagonal in plan to 2 feet above the door, where the form changes to the usual cylinder, having the haunches at the angles of the hexagon finished by pyramidal weatherings.

The construction of the walls, as might be expected, depends greatly on the nature of the stone used, and the facility of working it. It is, in some cases, wholly of rough stone and uncoursed, whilst in others the stones, though undressed, are ranged in courses; in these instances the material is granite or other plutonic rocks. The greater number of towers are of coursed work, in which very large stones have been chopped or chiselled to the curve on the face, but the beds and joints are unwrought. Near the base of the tower it is not uncommon to find stones 7 or 8 feet long, and even longer. This construction is usually of limestone, and the best example, shewing great accuracy in the fitting together, is seen in the Tower of Kilmacduagh; others are of sandstone, and a few of the harder rocks. In another class the stones are jointed as well as faced, but not worked to parallel sides and joints.

Examples are found at Aghadoe, Co. Kerry, Devenish, Co. Fermanagh, Cashel and two or three other places. A still more advanced style of work is the ashlar in squared courses, found at Ardmore and at Clanmacnois. These two last classes are executed in sandstone.

In connection with sixteen of the existing towers, or where there is undoubted record that they once existed, are churches exhibiting in their doorways, windows and walling, the same peculiarities as the towers. The doorways are flat-headed, the jambs incline inwards, and the flat band architrave is found on the face. The windows are exceedingly small, flat angled and round headed, but differ from the tower window in being splayed inwards; usually having an arched head on the inside, but sometimes a flat one. The jambs are inclined like those of the doorways. Where these characteristics are wanting, I have found nineteen instances of decidedly Romanesque churches, the character exhibited by the zig-zag and other ornaments common to the style which throughout Western Europe arose with its present chief monarchies and divisions; the remainder belong to the era of pointed architecture, which, I am inclined to think, was not practised in Ireland till after the first irruption of the English, A.D. 1167. At this date pointed architecture in England was just emerging into a distinct style: Salisbury Cathedral was not commenced till fifty-three years later, but the pointed arch had appeared in union with Norman characteristics in Dunstable Priory, erected A.D. 1131-1135, and was so used still later in the circular part of the Temple Church, dedicated A.D. 1184. At that period circular belfries had been erected in England. Mr. Hudson Gurney examined above fifty mostly in Norfolk and Suffolk, and found others in Cambridgeshire, Essex, Sussex, and Berkshire. He found them to be chiefly of Romanesque architecture, but also of the various dates of the pointed styles, assigning only to one a date earlier than the twelfth century. Though earlier than any he described, the curious circular turret at Brixworth was not mentioned by him. There can be no doubt of the correctness of Mr. Gurney's conclusions. These English towers have nothing in common with those of Ireland except their rotundity; they are always attached to the churches (generally at the west end), and opened to them by means of an archway; but there is usually no doorway in the tower. There are frequently many windows in each story. In these particulars there is no analogy, nor is there in the dimensions; the highest being only 56 feet, whilst the usual diameter exceeds that of the largest of the Irish towers. In Scotland, however, two examples are found precisely agreeing with the Irish, at Brechin and Abernethy, both on the east side of Scotland, and consequently most remote from Ireland. It is now well ascertained that the Scots were an Irish people first established in Caledonia in the third century of the Christian era. At the beginning of the sixth century the colony became a kingdom of small extent on the Western side of the present Scotland, and in 843 finally mastered the Picts, and henceforth included the whole of the North of this island. It was not therefore till 843 that the two places on the East coast where towers exist came into the possession of the Irish: hence may be found a reason for assigning a date after this period to those two towers; but it is by no means conclusive, for a church had previously existed at Abernethy, which was the metropolitan see of the Picts, whence it was removed to St. Andrews by the first Irish sovereign. Still it can hardly be doubted that these two edifices are purely Irish, since it was from Irish missionaries and the Apostle of Ireland and Scotland, St. Columbcill, that the Picts obtained Christianity, and in the Irish annals there is the record of a church at Apur-Crossan (now Applecross in Rosshire), erected in Scotland in 671 by an Irish ecclesiastic. There are remains of an ancient church here existing to this day. Other churches were of course built by the same people, and it is likely that other towers have also existed.

To the Irish then it seems these towers are peculiar, and to Irish history we must resort for records of them. The mention of them in ancient annals is rare. They are there designated by a name which Dr. O'Donovan and the best Irish scholars of this day agree in translating as "bellhouse," although advocates of the Pagan theories have attempted to give it a different meaning. It is not necessary to enter into this question. I need only say, that according to the earlier translations, the word was understood to mean and was translated "steeple," by those who had no theory on the subject to favor or maintain. Dr. Petrie has demonstrated the errors of others and explained his own views in support of this interpretation. Giraldus Cambrensis who went to Ireland in 1185 in the train of Prince John, afterwards King John, and returned to England in 1187, has been referred to by all writers on the subject as the first foreigner who noticed the round towers. In his topography of Ireland, when describing the supposed origin of Lough Neagh, he remarks—that an ancient inundation had submerged the extent of country covered by it, and that this tradition was supported by the natives on the ground that they could still see beneath its waters, those ecclesiastical towers, which after the manner of the country, are narrow, lofty and round—"turres ecclesiasticas quæ more patriæ arctæ sunt et altæ, nec non et rotundæ." This notice and another by the same writer, first pointed out by Dr. Petrie, in which by the same title, ecclesiastica turris, he speaks of a tower at Kildare, where a round tower still exists, and relates a tale concerning a hawk which was believed to have inhabited it from the days of St. Brigit, shew that at the coming of the English into Ireland these structures were regarded as ancient. It may help to limit this antiquity to know that of the sites which now possess them, or did once, a great number can be traced to have been occupied by churches or ecclesiastical establishments founded after the arrival of St. Patrick, the great apostle of Ireland. He arrived in 432, when, although Christianity was not unknown, the prevalent religion was a system of Druidism very similar to that which Julius Cæsar had found in England. Before the death of St. Patrick, the greater part of the population had with extraordinary alacrity embraced the new religion, which required for its rites buildings not necessary but useless for the religious rites of the Druids. In cromlechs, pillar stones and similar monuments, not peculiar to this island, we have abundant evidence of the pre-existent religion, besides the records preserved in the various annals composed in the early ages of Christianity. Of less than 120 sites with which we are more particularly concerned, it is on record (as far as I know at present) that ten of them had churches or ecclesiastical establishments founded in the first century of Irish Christianity. In the succeeding century, from 500 to 600, I find eighteen of these sites of which similar foundations are recorded, or when it is then first ascertained that such buildings or establishments existed. From 600 to 700, nine new foundations; from 700 to 800, four; from 800 to 900, seven, of which probably only three were founded so late as this. In the two following centuries, I find only one place appearing on the list for the first time; but 1100 to 1188 brings five places, which, though then making their first appearance, were with respect to four of them older foundations, and the fifth, which was new, is one of the five places whose attached tower we set apart at the commencement for distinct consideration. We thus see that of 54 sites of these round towers, 28 had ecclesiastical establishments before the expiration of the century following St. Patrick's arrival. The others had them at various periods down to probably the year 1000, or a little later; further research, would of course, add to the list. Of the round towers themselves under the term corresponding to "bellhouse," the earliest notice which Dr. Petrie has found is of the year 948, which records the burning of Slane steeple, a steeple which has long ceased to exist. In 964, is recorded the death of an ecclesiastic who had built the church and steeple of Tomgraney, which it is also recorded was repaired by King Brian Boroim, who lost his life in the great battle of Clontarf, A.D. 1013. This steeple is gone but the church remains. The next notices are in 996, 1020, 1039, 1050, recording injuries by accident or violence to these steeples, one being twice mentioned with the destruction of its bells. None of these towers now exist, but the records of 1076 mention the death of a chieftain in the steeple of Kells, where he had taken refuge, by the hand of a rival chief. In 1097, the injury done by fire to the steeple of Monasterboice, (now existing), with its books and treasures, is mentioned; in 1121, a tower previously noticed, had its conical cap blown off; and in 1124, the finishing of the steeple of Clonmacnois is described; this again in 1135, had the head or conical cap struck off by lightning, and in the same year another was injured by the same means, this still exists in an imperfect state. In 1127 and 1147, we read of steeples which do not now exist struck by lightning or burnt by marauding forces. Then in 1156, Fertagh steeple (still existing), was the scene of a murder. In 1170, the steeple of Ardbraccan fell. In 1171, another (now no longer existing) was burnt, filled with people who had taken refuge in it from their enemies. These notices mention fourteen round towers between 948 and 1171, of which five still remain. The conclusion that they were all round towers can scarcely be avoided. So far as I have seen or heard, there is not in existence a square belfry of so early date. That they also contained bells is clear; indeed at Clonmacnois, the bells remained till the place was pillaged and ruined in 1552. The earliest square towers which I know are the two occupying the position of transepts in the remarkable church called Cormac's Chapel, on the Rock of Cashel. This church was erected between 1101 when the King of Munster gave the site to "God and St. Patrick," and the year 1134, when the consecration of the church is recorded. From it we may now endeavour to arrange in a chronological order the materials before us, only referring to one notice of later date, 1238, where it is recorded that the steeple of Annadown was erected. Nothing remains to show whether this was a square or a circular belfry. It has usually been assumed that it was circular.

Cormac's Chapel, finished about 1134, consists of a nave and a chancel, with a recess for the altar, and two towers placed as transepts. The nave has a barrel vault with hoop ribs, but the chancel is groined. The whole is roofed with stone, carried on an upper vault constructed on the barrel principle, but pointed, and the space between the vaults contains two apartments, one over the nave provided with a fire-place, the other over the chancel. Stone stairs in the south tower give access to these crofts, and the north tower contained a series of timber floors, all of which are destroyed. The whole interior of the church is only about 47 feet in length. The general character of the work is at once seen to be different from and of later date than that of the round tower at the same place. Another church, that at Aghadoe, where the stump of a round tower remains, is recorded as finished in 1158. Of the original church, the only feature remaining is the beautiful west doorway, which serves to confirm this position. At the beginning of the preceding century, Brian Boroim was monarch of Ireland; he died A.D. 1013. It is recorded that he repaired the steeple of Tomgraney: the prelate who built this very steeple and the church of Tomgraney (in the County of Clare), died in 964. Traces of the steeple are said to have existed some forty years ago. The church remains and is used to this day. The plan is a simple parallelogram, 84 ft. in its extreme length, and 28 ft. in width. The building exhibits two distinct periods of work; the western portion being of the irregular coursed masonry in large stones seen in many of the towers, with buttresses projecting westwards in a manner unused in any of the later buildings, and in the west end a flat-headed doorway of the design which frequently occurs in the towers. This doorway is 6 ft. 4 in. high, 3 ft. 1½ in. wide at the top, 3 ft. 6 in. wide at the bottom, and constructed in six stones all going through the wall. The eastern portion is of well wrought and squared ashlar, the angles ornamented with shafts with well carved capitals and bases. The western portion I consider to be a remnant of the church erected before 964, unless it be shewn to have belonged to a church known to be here 200 years before that time, and the eastern was probably the work of a later date, perhaps of the time when King Brian repaired the steeple. This conjecture is supported by the remains of a church on the island in Lough Derg, called Holy Island, or Inniscaltra: it is visible from Tomgraney, and contains several churches and a round tower. The principal church 45 ft. from the tower, has likewise work of two distinct dates. The nave walls and one small window are of the more ancient description, but the other window (distinctly an insertion), the chancel arch and west doorway, are of a later date, as well as the chancel, which is of square ashlar. It is recorded that this church was erected by the same King Brian, whilst we also know that a church was founded here some 250 years before, which was plundered and burnt more than once by the Danes. We may therefore conclude, that King Brian used as much as he could of the old walls, and that the chancel and ornamental features noticed, were his work. We shall then without difficulty give the same date to the east end of the church at Tomgraney, and a previous date to the early work of the church and to the round tower at Inniscaltra. A little earlier than the record of the erection of the tower and church of Tomgraney in 964, is that of the cathedral at Clonmacnois, built by an abbot who died in 924. The principal mark of its early antiquity is found in the peculiar buttresses at the ends. Almost the only other feature of an early date remaining, is one capital with the jamb of the west doorway. At the same place there are two remarkable sculptured crosses and the remains of a third; one of the three is sculptured with subjects, some of which are readily identified as Scriptural, and it is shewn by ancient Irish inscriptions upon it, to have been erected as a monument by the same Abbot Colman who erected the cathedral to the then reigning sovereign of Ireland. Clonmacnois was then, and had been from its foundation by St. Kieran about A.D. 544, one of the most important religious establishments in Ireland. Of its early celebrity as a place of sepulture, there is existing evidence in the forty ancient inscribed and ornamented gravestones, many of which bear the names of abbots and bishops, and others who are elsewhere recorded to have lived in early times. The earliest I have noticed thus identified is of the date of 724, and the latest 1025. Of the other churches, two are distinctly as old, and probably older than the cathedral. There are also the two round towers, one which was mentioned as finished in the year 1124; the other is attached to St. Finian's Church. The crosses are also mentioned in ancient records; first in 918, then in 957; then in 1060, one of them, doubtless the one to which a date is assigned above, is called "the Cross of the Scriptures," and lastly in 1070. Near the site of another of the round towers at Monasterboice, stand three crosses, two richly sculptured, and one bearing an inscription, from which it may reasonably be assigned to the same date as Abbot Colman's. At other sites crosses are mentioned in the annals of 847 and 1166. All considerations united, there is good ground for supposing the principal of the two round towers at Clonmacnois to be at least as old as the cathedral, and I incline to think it older, which is I believe the case with the little oratory or church which bears the name of the founder St. Kieran.

At Glendalough, in addition to the great round tower, there is one of the attached round towers, which, it may now be observed, corresponds in its architecture with the others. It is placed on the barrel vault of St. Kevin's church. Originally this building was a simple parallelogram, 22 ft. 6 in. by 14 ft. 6 in., internally, covered by a semi-circular barrel vault, and roofed with solid stone of slate rock carried on a pointed barrel vault, an apartment being formed between the vaults. To this a chancel was afterwards added, which has wholly disappeared, the groove only being left in the end of the nave into which the chancel roof fitted. This shews that the chancel did not bond with the nave, the same is also the case with the sacristy still standing, and which was coeval with the chancel. The original east window is still visible, though blocked up in the end wall of the nave, and partly destroyed by the opening for a chancel arch which was made by merely cutting out the wall without inserting any voussoirs, the courses running out horizontally to the edge of the circular-headed opening.

Corresponding in its character with these additions is the round tower placed at the west end of the church, and measuring only 39 ft. 10 in. from the ground to the base of its cone. The quadrangular door, with a discharging arch like that of the cathedral, and other features, attests the antiquity of the building. The burning of this church is reported A.D. 1163. Another of the exceptional towers was attached to the church now called Trinity Church, at this place. The tower was standing at the end of the last century, but now only a fragment of the base remains, containing one small and very early window. The antiquity of the church is attested by the quadrangular west doorway which opened into the tower, and other features. The tower was square at the base and cylindrical above. Another tower, square at the base and circular above, exists at Killashee. It was from the first attached to the west end of a church, and had an opening into it formed by a large semi-circular arch of unhewn stone. The existing church is modern. The features of the tower display the marks of great age, but are in many respects peculiar. Built into the walls is a piece of wrought and moulded stone of early date. On the whole this was probably a late erection of the kind, but a church existed here from the very earliest introduction of Christianity, the founder of which died in 460.

The fourth attached tower is that of the Church of St. Finian at Clonmacnois. It stands south of the chancel, with an opening to it through a semi-circular headed doorway with inclined jambs, placed at the level of the chancel floor. Some of the windows are slightly recessed on the outside; it has not the four windows at top which are seen in other towers. The masonry is in parellel courses, and is bonded to, and corresponds with that of the church. The tower is only 45 ft. 3 in. high to the cornice, and 11 ft. in diameter. The conical roof is much dilapidated, but the peculiar arrangement of the stones with herring bone joints can still be detected. The church is coeval with the tower, and has a very rich chancel arch with zig-zag and other ornaments. The only historical evidence I know is that from the annals, shewing that it existed in 1015. The fifth attached tower was at the church at Dungiven, and had an erection called a round tower at its south-west angle, known to me only by two inferior prints. It fell in 1784. The church was founded about the year 1100, and has some interesting remains of that date, but it was extensively altered in a later style of Romanesque work, and again in both the first styles of pointed architecture; from all appearances I think the round tower was only a small turret set on the south-west angle of the nave, and that it was not coeval with the first church. I ought perhaps to allude to two others which have been called round towers, but which were evidently not of the same nature. Trummery Tower in the County of Antrim, fell about 25 years ago. It was attached to the north side of a building which does not seem to be old, but occupies the position of chancel to a ruined church. The remains are mere traces, from which I could not attempt to define dates, but the published drawings and descriptions of the tower shew it to have been very small as compared with others; and it is evident from the lower steps of a spiral stair of the rudest construction still remaining, that it was a stair turret. In this it agrees with the remaining one at Tamlaght-Finlagan, in the County of Londonderry, where the commencement of the stairs also remains. This one was square at the base, and attached to the north side of the church at its west end; the fragment is only seven or eight feet high. The building is known to be as old as the era of pointed architecture, to which I think it belongs, but a church stood here in the seventh century. The broken walls which remain do not indicate the date with any certainty.

I must just revert to the ornamented tower doorways at Timahoe, Kildare and Dysart, in order to remark, that having seen that ornamented architecture was in use about the year 1000, and judging by the sculptured crosses and some other remains of still earlier date, there is good reason to suppose that these doorways are only enriched specimens of the earliest era. The shape of the opening, the low relief of the carving, and the peculiar caps and bases, shew such a difference between them and the enriched specimens established to be of later date, that it seems to me we cannot be mistaken in giving to Timahoe a date as early as 880, at which time I first find mention of an abbot of the place; and to Kildare (which we know from Giraldus Cambrensis was reputed an ancient building in his day), at least an equal antiquity. Dysart doorway is probably older, as the ornament is only a slight advance on the band architrave.

We have seen that arched doorways prevail in the greater number of towers, and it might be expected that doors of the same form would be found in the associated churches of the same period. It is curious, however, to notice that in every instance where we have the coeval church and tower, the tower doorway is arched and the church doorway flat-headed. Churches with arched doorways with inclined jambs do exist, and probably of equal age with the others, but I have never seen such doorways belonging to churches in association with round towers.

One of the purposes for which the towers were constructed may account for the destruction of many. We have seen that they were resorted to for defence and security, and that they were intended to be so is evident from the means used to fasten the doors inside, and from the position of the doorways at a height above the ground. To this it has been objected, that their inside diameter (not more than 8 ft.), is so small that they could not contain any number of persons. It may well be supposed that they were more especially intended for the clergy, with relics, books and valuables which would not occupy much space, but some of the numerous floors would be available for other people. It is only lately that a gentleman who has not favoured this view, has published an old account of a siege of one of these towers which took place so late as 1642 at Ardmore. The castle adjoining the church-yard and the round tower were held by a force, of whom 114 men with 183 women and children were in the castle, and 40 men in the round tower. The castle was reduced when threatened by a piece of artillery, and afterwards the 40 men with two muskets who held the steeple submitted. This fact shews how serviceable the building would have been in earlier times, and this use of them may account for the position of the windows in the shaft being so near to the several floors, as it would expose the assailants when near the building, while the facing of each of these windows towards a different point of the compass would be another aid to the defenders.

The facts before us seem then to show, that from the ninth century down to the age of Cormac's chapel, ornamented architecture, partaking of the character of the Romanesque of other countries, was practised in Ireland; and that this style, modified by the extensive intercourse which it is known was maintained by the Irish clergy with the continental nations, had arisen out of a state of the art peculiar to the country in the centuries between the fifth and the ninth, but common in many points to the efforts of other nations in the infancy of the art of building with stone;—that for the origin of this phase we must look to the builders who had the skill to raise the massive stone forts of which some remain to this day, whose antiquity is historically certain; and that as there is no doubt that many of these forts were the work of the Pagan ages, it is also likely that their construction without mortar may have been afterwards continued, although mortar then came very generally into use, and the round towers and their churches are all built with that material.

From this survey and review, we may, I think conclude, that the round towers and the churches coinciding with them, rose with the foundation of the establishments recorded in the early ages of Christianity, and that as those foundations belong chiefly to the era between 432 and 700, we shall not err in supposing that the round towers and corresponding churches belong nearly in the same proportion to that period, but that others date their origin nearly as late as the year A.D. 1000.

Mr. Godwin, Fellow, considered it a matter of great regret that the architectural antiquities of Ireland were not better known and more studied by young English architects. He had never been more impressed with any architectural scene than on his first visit to Ireland, when he saw a beautiful group of churches and crosses, with a round tower in the centre, at Monasterboice. These objects were met with quite unexpectedly in the midst of extensive tracts of country. At Monasterboice there were the ruins of two or three churches and two or three crosses, one of them 23 or 24 ft. high, and towering above them all, in the centre of the group, was the wonderful round tower shown in the drawings. The effect of that tower, when the spectator stood at the foot and looked up and saw the clouds sailing rapidly across the top of it, was most extraordinary. Some of Mr. Hills' drawings shewed very well the connection which existed between the modes of architecture adopted by all the early nations of antiquity. In the Irish round towers there was seen a pelasgic character in the openings in the masonry; the same was displayed in the mode of covering many of the mounds, of which no mention had been made by Mr. Hills, and in which the passages were covered by stones projecting one over the other and ultimately closed by one stone, as was the case in the earlier Treasuries and ancient buildings of Greece. In looking at the drawings he found another illustration of the fact, that all architectural forms have been arrived at step by step; and they served, among other instances, to caution the profession against the possibility of arriving at once at a new style of architecture. The mound of earth, or the few stones which were thrown over the grave by all the early nations, formed, no doubt, the germ of the Egyptian pyramids; and some writers had thought that the germ of the finest Greek temple, in all its purity and elegance, could be traced in a simple altar stone. It appeared to him that the Irish round towers were merely an elaboration of the simple pillar of memorial, or stone of memorial, which had been employed from the earliest antiquity, and was mentioned in the Holy Scriptures as one of the first things raised by the children of Seth. The pillar of Tara which had been alluded to by Mr. Hills was one of the same kind; and there was another at Rudstone, in Yorkshire. Without however entering into any dissertation on the origin of these interesting monuments, the object he had in rising was to move the thanks of the meeting to Mr. Hills for his valuable paper; and he would also take leave to propose the same to Mr. M. Digby Wyatt for the interesting description he had given of the Crannoges, which displayed a species of construction very little known, and took them back to very extraordinary state of society.

To an enquiry respecting the material of which the floors of the towers were constructed:—

Mr. Hills explained that he only knew of three stone floors now existing, and all of them were imperfect. They were in the form of very flat domes. He believed the floors were generally of wood, borne upon projecting sailing courses, and the fact of their being of wood, accounted for the frequent notices in ancient records of the burning of these towers.

Mr. M. Digby Wyatt, H.S. observed that one of the points which had been referred to was particularly interesting, namely that the door of the Round Tower was turned in the direction of the church, shewing that there would have been some communication between the one and the other, by which the priest might be able, in times of great danger, to remove from the church the valuables which it contained, and the relics of the saint, to the upper part of these towers, which was, no doubt, a place of refuge and defence.

Mr. Donaldson, H.S.F.C. observed that the doors were not always turned towards the church.

Mr. Hills thought there was no exception.

Mr. Donaldson said, it was not the case at Kilkenny.

Mr. Hills said that the church there was much later. He believed, indeed, there was no exception to the rule. Whenever the church was coeval with the Round Tower, the door of the tower faced the church. The church of Kilkenny was of much later date than the Round Tower. It was built shortly after the coming of the English, and all vestiges of any older building, excepting the tower, had disappeared.

Mr. FRASER, C.V. said that his own observation of these antiquities had led him to believe that the churches generally were of later date than the Round Towers, and that the churches were built to the towers, and not the towers to the churches. He should be glad to know if Mr. Hills had come to any conclusion as to the original intention and purpose of these towers. Perhaps the circumstance of the windows being placed within 8 or 10 inches of the floors might illustrate this; at all events, it was a very interesting question whether these towers were monumental, whether they were erected for the purposes of defence, or as light-houses, or bell-towers. It was true that bells might have been adapted to them, but he did not think they could have been originally intended for bells.

Mr. DONALDSON said that in a tour which he had made in Ireland three or four years ago, he had come to the conclusion that these towers were really bell-towers and originally attached to churches. As Mr. Hills had explained, they had some of them six openings, and others eight openings, at the top; and he had no doubt that the priest had a hand-bell which was rung outside these openings. Large bells were not necessary. In Greece, for instance, the congregations were called to church by striking an iron bar, as bells were forbidden. He also believed that these towers were places of defence and refuge, and for the preservation of treasures, as, indeed, even the old churches in Ireland were, because the parapets of the roofs and of the towers were crenellated.

The Chairman, Mr. J. J. SCOLES, V.P. inquired why Mr. Hills supposed the towers were originally bell-towers?

Mr. HILLS explained that the term by which they were described in the ancient records signified "bell-house," and this meaning was well established by the best scholars of the day. There were no ancient bells remaining in any of these towers at present, but some of them still contained some bells of modern date of considerable size. They were certainly well suited for bells, and the small hand-bells which Mr. Donaldson had alluded to had been found in connection with many of them.

Mr. DONALDSON sketched one of the small hand-bells, of which several specimens of very ancient date had been discovered in Ireland, some very highly ornamented.

The CHAIRMAN inquired of Mr. Hills whether he thought that the circular form had been adopted for these towers for any particular reason, such as insuring greater strength, or on account of the nature of the material which was employed. In Norfolk and Suffolk there was an absence of freestone, and, in fact, there was nothing but flint to be got in the neighbourhood, and this material appeared to have led to the adoption of the circular form for the towers of those counties.

Mr. HILLS said that the circular form had certainly not been adopted in Ireland to suit the material, because a great deal of trouble had been taken to work to the curve the stones which were used, and in working the large stones of 7 or 8 feet in length, which were often employed, a great deal of labour must have been incurred. He thought that the reason for the circular form was its strength and durability; and that this form did possess such durability was, he thought, fully proved by the fact of the great number of Round Towers now existing, whilst there were so very few Square Towers even of much later date.

After the votes of thanks to Mr. Digby Wyatt and to Mr. Gordon Hills, the meeting adjourned.

AN ACCOUNT OF THE NEW PALACE AT WESTMINSTER, AND THE PROGRESS OF BUILDING THE SAME.

By Edward M. Barry, Associate.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, Feb. 1st, 1858.

I have undertaken to give some account of the New Palace at Westminster, or, as it is more commonly called, the New Houses of Parliament, and the progress of building the same, but I very much wish that this could have been done by the only person competent to do it. Seeing, however, that this unfortunately cannot be, I must appeal to you for that indulgence which is seldom refused to those who endeavour to do their best. The disadvantages of discussing in this room the works of living architects are obvious, and by no means inconsiderable, but there are also special reasons why to do so occasionally may be desirable. The objections alluded to chiefly apply when any detailed criticism is attempted, or any one-sided endeavour made to forestall the calm judgment of posterity. On the other hand, many details, both of progress and design, can be best treated of when they are fresh in the mind and not effaced by the lapse of time passed in the practice of an absorbing profession. My province to-night is a very humble one. Criticism in the present case would only be an impertinence, and I propose simply to describe a few of the steps taken in the erection of the largest public building of our day; to indicate a few of the difficulties with which the architect has had to contend; and to give some general description of the structure which has been his constant anxiety for nearly twenty years. An architect is under great disadvantages in carrying out his views, when compared with his fellow artist the painter or sculptor. These for the most part design and elaborate their conceptions in the retirement of the studio; they acknowledge no master, are only subject to the restraints their vehicle imposes on them, and seldom submit their works to criticism until they have made them perfect to the best of their ability. An architect, on the contrary, works under an universal censorship; he is controlled and hampered when he is often considered most free, and his works are invariably judged by the experience of parts which are often the least important portions of his design: I say nothing here of cases where his conceptions are never realized, for my hearers must know too many cases of disconsolate churches linked to headless towers to need to be reminded upon this point. Architects again are peculiarly exposed to that species of cheap criticism, which consists in calling names, and of which we have now too many examples, while, above all, their errors once made are perpetuated without power of recall. They are also incessantly liable to attacks which they have no opportunity of resisting, and public bodies too often appear to find the process of condemning an absent and unheard architect a pastime, as pleasant as it is unquestionably safe. I do not say this with a view of in any way deprecating fair and genuine criticism in architectural works; on the contrary, I think there is far too little of it, and am quite sure that an architect may always benefit by its free expression: as regards the present instance, I am firmly convinced that the New Palace at Westminster, as it stands with all its excellencies and defects, will hold its own against most assailants; but I do think that if an architect's position were fairly considered, we should have something more of calm enquiry, and something less of that trenchant declamation into which so-called architectural criticism seems so apt to glide. A building like the New Palace at Westminster, which is not only the seat of the two Legislative Chambers, but is also the greatest Public Office in the country, must in the nature of things attract considerable attention, and it has therefore been thought that some description of it might not be uninteresting to the Members of the Institute. Before however I proceed to describe the building as it now exists, it may perhaps be desirable to dwell for a short time on the preliminaries to its erection.

Many of those present will be able to remember, though I cannot, the burning of the Old Houses of Parliament on the night of Thursday, the 16th of October, 1834. An order had been given by Mr. Milne, a Commissioner of the Office of Works, to destroy certain tallies in the Tally Office of the Exchequer, and through some misapprehension of orders these tallies were burnt in the stoves of the House of Lords, the flues of which would appear to have been defective and to have thus caused the fire to spread to the whole edifice, which very soon became a prey to the destructive element, so that at one time even Westminster Hall was threatened.

Immediately after the fire an official enquiry was prosecuted before the Privy Council as to the causes of the disaster about which hung considerable mystery, in consequence of some suspicions that it had been the work of an incendiary; but after a patient investigation their Lordships reported that the fire was purely accidental, and had been caused by the burning of the tallies above-mentioned. Of course the re-construction of the building immediately engaged the attention of the Government, and after Committees of both Houses had reported on the accommodation required, an open competition was advertized in July, 1835. The conditions of competition were in many respects similar to those recently issued for the Government Offices, with one remarkable exception, namely, that they prescribed the style of architecture to be employed, which was to be "Gothic, or Elizabethan." The conditions also provided that the King should be requested to appoint Royal Commissioners to report on the plans of the competitors, who were to send in their designs by the 1st of November of the same year. In compliance with this invitation ninety-seven designs containing from one thousand to twelve hundred drawings were received, and while these were in course of preparation, a Royal Commission was issued to the following gentlemen, all of whom it may be remarked were amateurs, appointing them judges of the competition;—Mr. Hanbury Tracy, Sir Edward Cust, Mr. Liddell, and Mr. Vivian, who reported on the 29th of February, 1836, in favour of designs 64, 14, 13, and 42, giving a decided preference to No. 64, which proved to be the work of Mr. Barry. After various enquiries bearing upon the nature and cost of the selected design, my father was instructed to prepare working drawings and estimates, which he undertook to do—while as regards his remuneration he consented (with a confidence not altogether justified by subsequent events) to leave it entirely in the hands of the Government. Accordingly on the 7th of April, 1837, the Office of Woods reported on the architect's estimate, which had been placed by him in the hands of Mr. Henry Arthur Hunt, who then possessed his entire confidence and advised him in all matters connected with the cost of the projected work. Messrs. Seward and Chawner, on the part of the Office of Works, having carefully examined the architect's estimate, reported their opinion that the design could be carried out for the sum of £707,104. which sum however they stated would not cover many extraneous works connected with the building. This estimate has been so often alluded to, and, as I think, so unfairly contrasted with the real cost of the New Palace, that I shall endeavour, before I conclude, to give some explanations concerning it, calculated to place matters in their true light before you. After this report from Messrs. Seward and Chawner, the works were ordered to be proceeded with, and the first vote of public money on account of the New Palace at Westminster was taken 3rd July, 1837. The first portion of the works was necessarily the construction of the river wall; and this was proceeded with under the joint superintendence of the architect and Mr. James Walker, the well-known Civil Engineer, who divided equally between them the customary remuneration of five per cent. for their services. A coffer dam was constructed in the river, and the foundations of the wall laid upon concrete varying from 1 foot to 12 feet in thickness. In constructing the foundations great difficulties were encountered, as the soil proved in many cases little better than quicksand, rendering it necessary in consequence to incur much extra expense. The coffer dam answered its purpose completely, and the foundations generally have proved quite successful. When the time came for the removal of the coffer dam, my father resolved, in consequence of his experience of the treacherous nature of the site, not to draw the piles as had been originally intended, but to cut them off level with the dredged bed of the river; this was accordingly done, and the lower part of the dam remains in the ground and acts as a fender, or advanced guard, to the building against the scour of the river. The face of the terrace wall towards the river was faced with granite in large stones, and the walls being, as far as possible, brought up to the level of the terrace, the first stone was laid without any ceremony by my mother on the 27th of April, 1840. While the foundations were proceeding, an enquiry was ordered to be made to ascertain the best and most durable stone to employ upon the super-structure. The Commissioners were Sir Henry (then Mr.) de la Beche, Mr. William Smith, Mr. C. H. Smith, and the architect; who, after a careful enquiry into the matters committed to them, presented a report on the 16th March, 1839, which is I doubt not well known to most present. The result of this report was the selection of the Magnesian limestone from Bolsover Moor and its neighbourhood as the best for the purpose; and though the stone has not perfectly withstood the injurious effects of a London atmosphere, it is doubtful whether any other selection would have proved more fortunate. From April, 1840, the works proceeded with great dispatch under the energetic management of Messrs. Grissell and Peto, who had obtained the contract after a limited competition among the first London firms; and it is only fair to those gentlemen to say, that from the commencement to the close of their connection with the building, their work and their arrangements for conducting the same were such as deserve the highest praise. In January, 1840, Dr. Reid was appointed to take charge of the warming and ventilating arrangements of the edifice with authority derived direct from the Board of Works; thus conferring on him a position altogether independent of the architect. Dr. Reid's scientific attainments are well known, and he certainly succeeded in warming and ventilating the temporary lath and plaster House of Commons; but while wishing to speak of him with all possible respect, I cannot help thinking that to give any man a control, independent of the architect, over so large and complicated a building was an administrative blunder of the highest order. Dr. Reid never professed to have any knowledge of construction or of the practical means of carrying out his plans, and this, as may be supposed, complicated matters considerably. Whether it was in any way wise to attempt to adapt one unvarying system to a huge building like that before us, with its various apartments devoted to so many different uses, occupied some by day and some by night, some in a crowded state, while others are empty, and comprising public halls, offices, debating chambers and private residences, I will not now stop to enquire; suffice it to say, that Dr. Reid's plans soon lost the confidence of my father, who considered them detrimental to the stability, safety and effect of the building, and that they consequently became the subjects of repeated controversies until the cessation of Dr. Reid's connection with the New Palace. Large flues and air chambers were constructed at a great expense, most of which are now comparatively useless, and delays and differences were but the necessary consequences of the error at starting. In the session of 1844, a Committee of the House of Lords which was appointed to enquire into the progress made with the works, in consequence of a natural desire on the part of their Lordships to enter their new House, and a still more natural inclination to blame an architect for anything inconvenient, commenced its labours, and reported that several alterations had been introduced into the design by the architect without any authority from the Government—an accusation he explicitly denied by stating that he had received authority express or implied for all he had done.

The alterations alluded to were a re-arrangement of a portion of the plan between the Victoria Tower and the House of Lords. The modifications were these.

By the original plans the royal carriage was to pass through the Victoria Tower, and set down his Majesty at an inner hall, from which a large flight of steps would have conducted him to his robing room adjacent to the House of Lords, with which it communicated. This was on careful consideration thought undesirable, for the following reasons:—1. The great size of the tower would almost necessarily degrade the appearance of the inner hall, and its important character seemed to claim for itself to be the entrance of the Sovereign. 2. The staircase, though possibly handsome in itself, would have occupied too much space, considering its only occasional use, and with the inner hall would have cut up the principal floor, and rendered communication difficult: the robing room was also somewhat contracted in dimensions, and there was nothing like the present Royal Gallery to serve as a waiting room for the peers, for the admission of strangers to view the ceremony of opening and proroguing Parliament, and other public purposes. Great objections were made by some members of the Lords' Committee to these modifications, and many inconveniences foretold, both to her Majesty and their Lordships, but I am not aware that practice has justified these predictions, or reversed the opinion of the Committee of the House of Commons, which sat soon afterwards, and resolved that "no blame "was to be attached to Mr. Barry for the course he had taken, and that they had every reason to "believe that all the alterations, hitherto made, had conduced to the convenience and general effect "of the building" It was at this time that many complaints began to be made in Parliament about the so-called delay in completing the building, and the anxieties consequent on the various committees and other enquiries, in addition to the unavoidable responsibilities of the architect, caused him a serious illness, and thus made a reality of that delay, which, up to this time, had been imaginary, as far as he was concerned. Indeed had it not been for the hearty and generous support of Lord Lincoln (now Duke of Newcastle) who was then first Commissioner of Woods, I do not think the works could have been carried to a completion by my father. His Lordship took special pains to make himself personally acquainted with the nature and bearing of the various complaints, and having satisfied himself that they were not based on justice, threw the whole of his official weight into the scale, and gave the architect no half-hearted or stinted support in carrying out his views, until the close of his official connection with him. Having now traced the history of the building up to 1844, at which date the plan had finally assumed the shape which has been since executed; I propose to give some description of the edifice as now existing.

It will be remembered that the competitors were directed to design either in the Gothic or Elizabethan style; the former was considered desirable by my father as being "homogeneous, well defined, and more or less in harmony with the existing ancient buildings on the site and in the neighbourhood," while the latter would, he thought, be unworthy of the character of a great national edifice, and inharmonious with the existing buildings. Westminster Hall is made a part of the plan, to form a great public entrance to the entire building, so that it may now be viewed as a part of a great whole, instead of being as hitherto an apparently isolated room, used as a waiting Hall by counsel and other persons in attendance on the Courts of Law. The window at the South end of the Hall was enlarged and is now refixed in St. Stephen's Porch, which forms the chief public vestibule of the New Palace. The beautiful crypt of St. Stephen's Chapel and the cloisters adjoining Westminster Hall have been saved from destruction, and form part of the Members' private entrance to the House of Commons. In restoring these, the fan groinings were found to be generally in a sound state, but all the rest of the work was in a deplorable condition. The cloisters have been carefully reinstated, and the windows glazed. Two great buttresses which formerly disfigured the quadrangle have been removed, and the roof of Westminster Hall has been repaired and strengthened with iron shoes and tie-bolts. Members going to the House have a choice of two entrances, one through Westminster Hall, and the other through the Star Chamber Court. This arrangement was considered desirable on various grounds, and circumstances of public excitement may easily be imagined under which a double entrance might be found extremely convenient. The arcaded passage at the West side of the Star Chamber Court serves the purpose of a porch, and Members then proceed to their private staircase, passing by the cloisters on their way, where they deposit their coats and umbrellas. They then proceed up a groined stone staircase to the upper floor, upon which the House of Commons is situated. A portion of the upper part of the cloisters is occupied by the British Paper Office, and another by a writing room for Members. St. Stephen's crypt is not yet out of the workmen's hands, but is in course of restoration. The groining here is in a very bad state, having been much injured by the fire. The carved capitals and bosses were also very dilapidated, and great difficulty has been experienced in collecting authority for their restoration, but by having squeezes taken of the parts in good repair, which will guide the workmen in their restoration, I believe that object has been now obtained. The crypt was used by the Speaker as his dining room before the conflagration, but is intended when restored to serve as the Private Chapel of the New Palace. It was considered very desirable that the various entrances and departments should be as distinct from one another as convenience of occasional access might dictate, and the Central Hall may be considered the key to the plan. A stranger passes to it through Westminster Hall and St. Stephen's Hall, and finds himself in an octagonal chamber with four archways leading from it, the other four sides being occupied by messengers, and the Electric Telegraph offices. On his right is the House of Lords, with its offices, libraries, and refreshment rooms surrounding it as a nut-shell does its kernel; on the left is the House of Commons, with similar appendages, while straight before him lie the committee rooms and offices connected with the public business of Parliament. St. Stephen's Hall is over the crypt, and occupies the position of the former chapel. It is groined in stone, and the bosses at the intersections of the groin ribs are sculptured representations of the life of St. Stephen, by Mr. Thomas.

The Houses of Lords and Commons are placed in the midst of surrounding buildings, from considerations of convenience of access to and from their offices, &c., freedom from noise or interruption, and general safety. The committee rooms, which are used by day, are placed in the river front, as being the most cheerful and appropriate place for them. The official residences of the Speaker and other officials of the House of Commons are at the North end of the building; while the South wing accommodates the Lord Great Chamberlain, the Black Rod, and other officers of the House of Lords. The Royal entrance is by the Victoria Tower, from which a flight of steps leads to the Royal robing room, an apartment 55 by 37, now in course of being painted in fresco by Mr. Dyce. Her Majesty occasionally grants audiences in this chamber, and having robed, then proceeds along the Royal Gallery (where strangers are admitted to witness the procession) into the House of Peers. The Royal carriage passes in the meantime under the robing room into the Royal court, where it turns round and returns to the tower in readiness to receive her Majesty at the close of the ceremony. The House of Peers is 90 by 45 and 45 ft. high; my hearers must be so familiar with its general aspect, from prints or personal inspection, that I will merely state that it is fitted up with elaborate oak framing, glazed with stained glass representing the various kings and queens of England, and highly decorated with gold and colors. Portions of the end walls have been painted in fresco by artists selected by the Fine Arts Commission, and niches between the windows display statues in bronze, by some of our first sculptors, of the Barons who signed Magna Charta. The House of Commons is a much plainer apartment, though not differing greatly in actual dimensions from the House of Peers.

After a few days trial, and before the Members had had time to get accustomed to the new chamber, judging moreover from morning sittings, when it is rare that any debate commands the attention of the House, it was determined to lower the ceiling for the sake of improving the acoustic qualities of the room. This was accordingly done, and has certainly not been an improvement as to architectural appearance, though it is said to have answered the purpose proposed. The ceiling is of oak, divided into a flat centre and two sloping sides; the panels in the centre compartment are perforated, and the House is lighted at night by lights placed over them under the control of Mr. Goldsworthy Gurney, who has succeeded Dr. Reid in his office of warmer and ventilator. This mode of lighting is, I believe, considered pleasant by Members, and has the advantage of being external to the room, and contributing to its ventilation; but the glare of unseen light and the deep shadows thrown in all directions, render it very destructive of architectural effect. The Refreshment rooms are supplied with lifts and other modern appliances, and are placed over their kitchen and offices. The Libraries are in the River front; and in the Ground floor a Smoking room is fitted up with every convenience for those hon. Members who wish to relieve their senatorial labors by a cigar. This addition, it may be remarked, is a modern innovation, and was not thought a necessary adjunct when the plans of the building were first arranged. With so many offices and apartments where members may place themselves, it may be imagined that it is a matter of some importance to give them early notice when their presence is required at divisions—this is effected by electricity. Bells are placed in upwards of thirty places, and are connected with a galvanic battery, so that the principal doorkeeper is enabled to make contact and ring all the bells at once, by pressing his hand on a button attached to the arm of his chair. Any stranger who happens to be in the corridors when the bells are ringing, will soon be conversant with the fact of a division being imminent, by the rush of Members in all directions towards the House, which places him in extreme danger of practically testing the hardness of the floor.

Having now given a description of the general arrangement of the plan, I propose briefly to touch upon the external features of the design. Few buildings have been more unfortunately placed than the New Palace at Westminster. A site full of quicksands and below low-water is seldom an agreeable incident in an architect's practice. Moreover, a large majority of the public first see the Palace from Westminster Bridge, which is decidedly the least favorable point from which it is to be seen. When the new bridge is completed, at the lower level, and with the greater width now determined on, a great improvement to the appearance of the New Palace from this quarter may be expected; though it is to be regretted that the new bridge, following the line of the old one, will not be at right angles with the building. But if the present view from the bridge be unsatisfactory, that towards the Abbey is far more so. Here we have the incongruous and unmeaning façade of the Law Courts, the mean houses of the South side of Bridge Street, and the unfinished face of the Clock Tower. It is to be wished that these disadvantages could be removed, and though there may be many opinions as to the best way of treating New Palace Yard, there will I imagine be few against endeavouring to give to the Palace on this side a more perfect and consistent appearance. My father has always advised the enclosure of New Palace Yard, and recommended the removal of the Law Courts from Westminster, not only for reasons connected with the convenience of public business, but also from the difficulty of providing the accommodation required on the very limited site at Westminster.

In designing the new Palace, it was resolved to avoid as far as possible any breaks upon the plan not absolutely dictated by convenience or the nature of the site, such breaks being considered to tend towards reducing the apparent size of the building when seen in perspective. The River front was accordingly carried out without any very considerable breaks in the plan, and reliance was placed on breaking up the sky-line to avoid monotony; thus the centre portion is raised a story above the rest, and towers with high roofs play a conspicuous part in the composition, while the main towers of the building rise behind and form a background to the numerous pinnacles and turrets, as seen from the river. The carving between the stories of the river front was intended as a record in stone of English History. There are thirty-five bays, exclusive of the two oriel bays; each of these thirty-five bays contains the arms of an English sovereign, beginning with William I. and ending with William IV. The oriel bays bear the present Royal Arms of England, with the motto, Victoria Regina feliciter regnans. All the stone carving here, as well as throughout the entire structure, has been executed by Mr. Thomas, to whom this department was specially entrusted by my father immediately after his appointment. Mr. Thomas has carried out my father's views entirely to his satisfaction, and in such a way as to make it impertinent in me to say one word of praise. Mr. Thomas' name and works are now familiar to every architect, and those who have the privilege of his private acquaintance will testify to the ability, skill and indomitable industry, which have won for him the position he now occupies. The wood carving in the interior was not entrusted to Mr. Thomas, but was placed by my father under the superintendence of a gentleman whose name ought never to be forgotten as long as admirers of Gothic Architecture exist in England—need I say that I allude to the late lamented Welby Pugin? Convinced that in all matters of Gothic detail Mr. Pugin was *facile princeps*, my father sought his aid, first, in forming a collection of plaster casts of famous examples both at home and abroad, and then in superintending the practical execution of this work, by occupying a position precisely analogous to that filled by Mr. Thomas with respect to thes stone carving. Mr. Pugin, with the spirit which always actuated him, readily assented to this proposal, and continued till nearly the time of his death to aid my father in carrying out his designs; in this manner his services were invaluable, and a number of carvers were trained under his auspices, more or less imbued with the spirit which animated himself. Mr. Pugin's department comprised the wood carving, the ornamental metal work, stained glass and tiles, at all of which he worked most indefatigably to carry out my father's views, which were naturally in many cases not altogether in unison with his own, but to which he at all times deferred. When I think of the good humoured discussions, and the frank and hearty criticism in which he used to take part, it gives a fresh pang to the thought that that voice will be heard no more, and that a luminary so bright should have suffered so mournful an eclipse. I have often heard Pugin called a bigot and enthusiast, and possibly some of his earlier writings may give a color to the imputation; I suppose, however, that no reformer of time-honored abuses who is thoroughly in earnest can avoid such accusations, and those who knew Pugin most intimately will hesitate to endorse such a charge, and will know that he was (especially in his latter days) far more candid than many who now echo his views, without acknowledging the source whence they are derived. It ought never to be forgotten that Pugin upheld sound principles of design and construction at a time when his opinions were far from fashionable, and that he consequently stood almost alone; and I think we of the present generation of Architects, who have benefited so largely by his labors, ought jealously to guard his fame, and not allow any one, however popular, to retail his opinions without giving due honor to their author. I must apologize however for this digression and proceed with my task of description. The residences of the various officials whom I have mentioned above are almost all now occupied, and have been fitted up with every regard to modern ideas of comfort and refinement. Though every portion of the fittings and furniture is of a Gothic character, it has been my father's aim to shew, as far as possible, that the notion of a Gothic house being necessarily inconvenient, is a fallacy founded upon an imperfect appreciation of the extent to which the resources of the style may be developed, and that there are no modern appliances from which the dweller in a Gothic residence need be debarred.

The most important portions of the New Palace, as regards its external appearance, are undoubtedly the main Towers, and a short description of these may not be undesirable. The Central Tower is now completely finished, and I will therefore speak of it first. The foundations were laid upon 7 ft. 6 in. of concrete, and great care was taken in building them, in consequence of the large apertures required by Dr. Reid, which pierce the basement story in all directions; the principal floor is carried upon a brick vault, springing from the walls to a circular cast iron curb in the centre, supported by columns, and the ceiling over the octagon or Central Hall is a stone groining 70 ft. span, without any central shaft; this groining was intended by my father to have been considerably higher than it now is, but the demands of Dr. Reid for extensive air spaces over it compelled the adoption of the present lower design. A strong wrought iron tie bar is inserted in the wall all round the tower, at the springing line of the groining. The upper part is carried upon a brick cone, starting from the top of the walls of the octagon. This cone carries the lower lantern, which in its turn supports another and a smaller cone, upon which the upper lantern and the spire are constructed. These cones were built without centering, and there were many peculiarities in the process of constructing the tower, but as you have already heard a description of these matters, I forbear to touch upon them now. The Central Tower was intended by Dr. Reid to be the central point of discharge of vitiated air from the whole building, but I believe Mr. Gurney makes little or no use of it for that purpose at present. The Victoria Tower is situated at the South Western extremity of the building, and its general features are no doubt familiar to you. The carefully executed model on the table by Mr. Mabey, will give a better idea of its appearance than any description that I can write. Great precautions were necessary with the foundations, as the site was extremely bad and full of quick sands. A double close row of piles was driven completely surrounding the site, the earth within this species of coffer dam was then excavated, and concrete thrown in to a depth of 10 ft. 7 in. Two courses of 6 in. landings were then placed on the concrete, and upon them the walls were carried up, without accident of any kind. The corner octagonal turrets are built hollow, being intended to be used by Dr. Reid for the passage of air. One of these corners contains an open iron staircase which gives access to the top; the upper portion of the turrets finishes with a light open pinnacle, in which a winding staircase will be inserted. The various floors of the tower are fitted up with iron beams and columns, forming so many fire proof receptacles for records and papers of value, and the plans have been so arranged as to admit of a lift passing up the well-hole of a staircase in the middle of the tower, communicating with the various floors. The roof is now in course of construction, and most of the iron-work for it is ready for fixing. My father has determined to make it of the general form shewn in the model, but there are some questions connected with the flag post and other details at present undecided. There is however little reason to doubt that this year 1858 will see the last plate fixed on the roof. In describing the towers of the New Palace, the Clock Tower must not be forgotten; it stands at the North end of the building, and from its propinquity to the bridge is perhaps made more the subject of comment than any other portion of the edifice. My father's view in designing this tower was to make the clock the predominant feature; all else was to be pedestal or roof. The windows are few and narrow, and hardly prevent the tower from appearing actually solid, while the roof with its decorative metal work and gilding, forms one of the most conspicuous features of the building, when seen from a distance. The model before you from the same skilful hand as the others, sufficiently explains the nature of the design. The interior of the tower is taken up by the shaft for the clock weights, a staircase from bottom to top, a large vitiated air-shaft required by Dr. Reid, and a few prison-rooms, supposed to be for the benefit of refractory Members of Parliament. My hearers have heard a great deal about the clock which is yet to come, and also about the unfortunate Big Ben, over whose tragic fate it only remains to drop a tear. Every arrangement in the tower is ready both for clock and bells, and has been so for a considerable time, but it is to be hoped that the new bell will not be in so great a hurry as the last, to ring his own dirge. Both clock and bell will be hoisted up the central shaft in the tower in the same manner as the whole of the building materials have been raised, for it may be remarked, in passing, that the Clock Tower as well as the Victoria Tower have being built entirely without external scaffolding,—hence the silly story about hoisting the clock and bells, which was started some time since. The clock faces are of cast-iron perforated, and the apertures in them are filled in with white glass, opaque by day, but admitting of illumination by night, without rendering visible the light placed behind it.

As the works of the New Palace proceeded, it was thought that the erection of so large and costly a National Building afforded a suitable opportunity for encouraging the artistic energies of the country, with reference to the embellishment of the interior by the sister arts of Painting and Sculpture. A Royal Commission was therefore issued to certain distinguished noblemen and gentlemen, presided over by His Royal Highness the Prince Consort. The architect was called on to present a report to the commission (of which he is not a member) expressing his views generally on the subject. This was accordingly done, and I may perhaps be permitted to quote some passages from his report:—

" With reference to the interior of the new Houses of Parliament generally, I would suggest " that the walls of the several halls, galleries, and corridors of approach, as well as the various " public apartments throughout the building, should be decorated with paintings having reference to " events in the history of the country, and that those paintings should be placed in compartments " formed by such a suitable arrangement of the architectural design of the interior, as will best " promote their effective union with the arts of sculpture and architecture; with this view, I should " consider it to be of the utmost importance that the paintings should be wholly free from gloss on the " surface, so that they may be perfectly seen, and fully understood from all points of view, that all other " portions of the plain surfaces of the walls should be covered with suitable architectonic decoration, " or diapered enrichment in colour, occasionally heightened with gold and blended with armorial " bearings, badges, cognizances and other heraldic insignia emblazoned in their proper colours. That " such of the halls as are groined should have their vaults decorated in a similar manner, with the " addition occasionally of subjects, or works of art, so interwoven with the diapered ground as not " to disturb the harmony, or the effect of the architectonic decorations generally, or interfere with " the elementary features of the architectural composition. That such of the ceilings as are flat should " be formed into compartments by moulded ribs, enriched with carved heraldic and Tudor decorations. " That these ceilings should be relieved by positive colour and gilding, and occasionally by gold " grounds with diaper enrichments, legends, and heraldic devices in colour. That the screens, pillars, " corbels, niches, dressings of the windows, and other architectural decorations should be painted to " harmonize with the paintings and diapered decorations of the walls generally, and be occasionally " relieved with positive colour and gilding. That the door-jambs and fire-places should be constructed " of British marbles of suitable quality and colour, highly polished and occasionally relieved by colour " and gilding in their mouldings and sculptured enrichments. That the floors of the several halls, " galleries and corridors should be formed of encaustic tiles, bearing heraldic decorations and other " enrichments in colours, laid in margins and compartments, in combination with polished British " marbles, and that the same description of marbles should also be employed for the steps of the several " staircases. That the walls to the height of from eight to ten feet should be lined with oak framing

" containing shields with armorial bearings emblazoned in their proper colours, and that an oak seat " should in all cases be placed against such framing. That the windows of the several halls, galleries and " corridors should be glazed doubly, for the purpose of tempering the light and preventing the direct " rays of the sun from interfering with the effect of the internal decorations generally; for this " purpose the outer glazing is proposed to be of ground glass in single plates, and the inner glazing " of an ornamental design in metal filled with stained glass, bearing arms and other heraldic insignia " in their proper colours, but so arranged that the ground, which I should recommend to be of a " warm yellowish tint covered with a running foliage or diaper, and occasionally relieved by legends in " black letter, should predominate, in order that so much light only may be excluded as may be thought " desirable to do away with either a garish or cold effect upon the paintings and decorations generally. " Practically, I consider that the double glazing will be of essential service in carrying out the " system of warming and ventilating proposed to be adopted in the building generally, which system " renders it unnecessary that the windows in those portions of the building above referred to should " be made to open, so that all prejudicial effects upon the paintings and other decorations which " might be caused by the dampness and impurity of the atmosphere, and much practical inconvenience, " and probably unsightliness in the means that would be necessary to adopt for opening and shutting " casements, would be avoided. That in order to promote the art of sculpture and its effective union " with painting and architecture, I would propose that in the halls, galleries and corridors statues " might be employed for the purpose of dividing the paintings on the walls. By this arrangement a " rich effect of perspective, and a due subordination of the several arts to each other would be obtained. " The statues suggested should be, in my opinion, of marble of the colour of polished alabaster, and " be raised upon lofty and suitable pedestals placed close to the walls in niches surmounted by enriched " canopies; but the niches should be shallow, so that the statues may be as well seen laterally as in " front. The architectural decorations of these niches might be painted of such colours as would give " the best effect to the adjoining paintings, being relieved in parts by positive colours and gilding, and " the backs of them might be painted in dark colours, such as chocolate, crimson or blue, or they " might be of gold for the purpose of giving effect to the statues. Having thus described the views I " entertain as to the character of the decorations of the interior generally, I now proceed to notice in " detail the special decorations and arrangements which I would propose for the several halls, galleries " and principal apartments.

" I would propose that Westminster Hall, which is 239 feet long, 68 feet wide, and " 90 feet high, should be made the depository, as in former times, for all trophies obtained " in wars with foreign nations. These trophies might be so arranged above the paintings on the walls " as to have a very striking and interesting effect. I would further suggest that pedestals, twenty in " number, answering to the position of the principal ribs of the roof, should be placed so as to form a " central avenue, 30 feet in width, from the North entrance door to St. Stephen's porch, for statues of " the most celebrated British statesmen, whose public services have been commemorated by monuments " erected at the public expense, as well as for present and future statesmen whose services may be " considered by Parliament to merit a similar tribute to their memories. The statues which have been " already proposed to be placed against the walls between the pictures, I would suggest should be " those of Naval and Military commanders. The subjects of the paintings on the walls, twenty-eight " in number, 16 feet in length, and 10 feet in height, might relate to the most splendid warlike " achievements in English history, both by sea and land, which, as well as the statues that are proposed " to divide them, might be arranged chronologically. To give due effect to these suggested decorations, " it is proposed that the light should be considerably increased by an enlargement of the dormer

" windows in the roof, by which also that extraordinary and beautiful piece of decorative carpentry of
" the fourteenth century may be seen to much greater advantage than has ever yet been the case.
" This noble hall, certainly the most splendid of its style in the world, thus decorated by the union of
" painting and sculpture and architecture, and aided by the arts of decoration as suggested, it is
" presumed would present a most striking appearance, and be an object of great national interest."
Here follow some detailed recommendations as to other parts, with which I shall not trouble you, after which the report proceeds:—" I have now described in general terms the whole of those portions
" of the building that might, I think, with propriety and effect be adorned with works of art and the
" arts of decoration, but in making the several suggestions which have occurred to me, I should wish
" it to be understood that I have merely stated my own views on the subject as far as I have hitherto
" been able to consider it in its general bearings, and with a view to shew how the objects for which
" the commission has been established may, if desired, be carried out in the decorations of the new
" building to their greatest extent. I should not, however, wish to be strictly confined in all cases to
" the adoption even of my own suggestions, as upon a more mature consideration of the subject in
" detail hereafter, when the shell of the building is completed, I may be induced to vary and modify
" some of the views which I entertain at present, and which, I fear, I have but imperfectly communi-
" cated in this paper."

The two drawings of St. Stephen's Hall and the Royal Gallery, by Mr. Nash, exemplify my father's views as above quoted, but since the time of their appointment, the Royal Commissioners have taken entire charge of the various fine art decorations which have been introduced into the building, and have held exhibitions in Westminster Hall of cartoons and sculpture submitted to them in competition. Frescoes have been painted in the House of Lords by Messrs. Dyce, Cope, Maclise and Horsley. In the upper waiting hall, River front, by Messrs. Cope, Watts, Herbert, Horsley, Tenniel and Armitage. The Queen's robing room is now in the hands of Mr. Dyce, and the Peer's robing room is committed to Mr. Herbert. Mr. Ward is also engaged on a series of pictures for the corridors leading from the central hall, some of which have already been exhibited. Bronze statues have been placed in the niches of the House of Lords by Messrs. J. Thomas, J. C. Thomas, M'Dowell, Woodington, Timbrell, Westmacott, Thornycroft, Thrupp and Richie. Large white marble statues have also been erected on the pedestals in St. Stephen's Hall, by Messrs. Foley, Bell, Marshall, M'Dowell, Bailey and Carew. In speaking of these last named statues, while admitting most of them to be extremely beautiful works of art, I cannot but regret that they should have been executed on so large a scale as to be detrimental to the architectural effect of the hall. The same remark would apply to the fine group by Gibson in the Prince's chamber. In this case the figures are more than 9 feet high, while the room is only 45 by 25. In the Prince's chamber Mr. Theed has designed some bas-reliefs of historical subjects in the panels, which have been electrotyped from his designs, and add greatly to the appearance of the room. Paintings have also been commenced in the wall panels of this chamber, which display satisfactorily the effects of the gold back-grounds which my father has always recommended as the most suitable in such cases. When I add that to Mr. Maclise is entrusted the embellishment of the royal gallery, I have, I believe, completed the list of works carried out by the Fine Arts Commission. With the exception of the works above mentioned, the sculpture of the building has been completed, as I before said, under my father's guidance by Mr. Thomas, as regards the stone carving, and by carvers under the direction of Mr. Pugin in all matters relating to the wood finishings of the building. The sketches of statues before you by Mr. Thomas will give some notion of the style of sculpture adopted. After many delays with reference to the ventilation of the House of Peers, which was ultimately removed from Dr. Reid's control, the Chamber was completed, and was opened on the 15th of April, 1847, without any public ceremony, and from that day to the present has been in constant use. The Peers' libraries and refreshment rooms were opened at the same time, and on the 3rd of February, 1852, the whole of the public entrances, with the House of Commons, Central Hall, and St. Stephen's Hall, and adjoining offices were delivered up by the architect. Since that time most of the remaining portions of the edifice have been completed, and at this moment very little remains to be done. The Speaker's house is all but finished, and will be occupied after Easter. The residences in the South wing will be completed in a few months, and before long the main towers, the Royal gallery, and the Royal staircase will be ready for occupation, so that by the close of the year the present works at the New Palace will be brought to a close. Much has been said about the time the edifice has taken to construct, but I think, in addressing an audience like the present, I have no need to say much on that head. It may suit those who imagine an architect can be urged onward to any extent by external irritation, to complain of the rate of progress at the New Palace, but when the difficulties of all kinds which have beset the work are duly considered, and it is borne in mind that the public business of the country has never been interrupted for an hour, but has always possessed temporary accommodation on the site, which has only been handed over piecemeal to the builders, architects at any rate will not think the time that has elapsed between the laying the first stone in 1840, and the completion of the building in 1858, has not something to show in the work that has been done.

I may now proceed to say a few words on the cost of the Palace, which, though very large, has been much exaggerated. The total cost of the structure up to the present time, as far as the architect is concerned, has been £1,768,979. 8*s.* 1*d.*; and it is not surprising that those who look at these figures, and then contrast them with the original estimate of £707,104. should demand some explanation of so enormous an excess. But the building to which the original estimate applied, and that which now exists, are two different things, though the public who call them both New Houses of Parliament, cannot be expected to understand the difference. The following are some of the many modifications of the design which have been sanctioned by the Government since the original estimate was made:—1. The river embankment and coffer dam were not included, and it was found necessary to go down much deeper for the foundations on account of the treacherous nature of the soil than had been at first intended. 2. A much harder stone was selected than that on which the estimate was based, and I may state that the labour on Anston stone is considered by competent authorities greatly to exceed that on Portland. 3. The building was ordered to be made fire-proof by the substitution of iron girders and brick arches for ordinary floors, and iron roofs instead of slated coverings were ordered to be formed. 4. Arrangements for warming and ventilating were expressly excluded, and those who will take the trouble to look at the general sections of the building will see by the space they occupy, compared with the habitable portions, that these can have been no inconsiderable items of expense; indeed, portions of the building were carried up for the purpose of providing continuous air and smoke flues in the cross roofs connecting those in the main building. The Central Tower is also an addition, not having formed part of the original estimate, nor having received the sanction of Parliament until the rest of the works were in an advanced state of progress. Many extra suites of rooms and offices have been added; amongst others, complete residences for the Clerk of the House of Commons, the Clerk of the Crown, and the gentlemen in charge of the ventilation of the building, as well as many other smaller works too numerous to be mentioned here. The works consequent on the orders of the Fine Arts Commission and the restoration of St. Stephen's Crypt, also formed no part of the original estimate, and a more elaborate mode of internal finishing was rendered necessary by the determination to make the building a means of encouraging the Fine Arts of Painting and Sculpture. When these circumstances are borne in mind, and the upward tendency of prices for labour and materials during the last ten years is also remembered, it will, I think, be seen that a mere comparison of the original estimate with the actual cost of the edifice does not present a fair aspect of the case; and many present will readily understand the numerous unavoidable expenses which gather round a building of such size and peculiarities as the New Palace at Westminster.

The present iron roofs were adopted in consequence of the requirements of the ventilating scheme which provided smoke flues stretching along the roofs in all directions, and which being necessarily heated to a considerable temperature required a fire-proof covering not likely to be injured by heat. Galvanizing was adopted as a means of protection after considerable inquiry, and after it appeared it had been used extensively in the public establishments of France. Experience has shown that, however well it may answer elsewhere, galvanized iron will not long resist the injurious effects of a London climate and atmosphere; and the means of protecting the iron roofs at the New Palace have occupied much of my father's attention. At last, after a great many trials of different paints and other compositions, one by Mr. Szerelmey, a Hungarian gentleman, has appeared to him to promise great success. Mr. Szerelmey has already applied his process to the roof of the Clock Tower and some other portions of the building, and if it should succeed, as it seems likely to do, the whole of the roofs will probably be treated in the same manner. Mr. Szerelmey also applies his composition to stone work, and has furnished me with the specimens of iron and stone, both of which are coated with his composition, which he informs me will not cost much more than a coat of ordinary paint, and will not discolour the stone.

No orders are yet given with reference to the remaining portions of the design adjoining Westminster Hall and New Palace Yard, and, in fact, the question of the removal or non-removal of the Law Courts from Westminster must be determined, before anything can be done with a large portion of these buildings, my father's designs for which are shown in a Parliamentary paper of the Session 1855. They display a great entrance gateway, with flanking turrets, at the corner of New Palace Yard, which would form the Public entrance to the building, as distinguished from the Royal entrance at the other corner under the Victoria Tower. The construction of the new bridge of twice the width of the present Westminster Bridge, with the increase gained towards the New Palace, will render the destruction of the houses on the south side of Bridge Street a matter of public convenience, and almost of necessity, and the lowering of the roadway can hardly fail to render the view of the building from it more favourable than it can be said to be at present. The Institute has already had the advantage of a very interesting description of the works of the new bridge, which are being carried on under the directions of Mr. Page, C.E., who is pushing them on with great energy. My father's views with respect to it have always been, that (assuming public convenience to require a bridge at Westminster), it should be as wide and low as possible, having regard to the importance of the traffic over it as well as the water traffic beneath. The width he was anxious to obtain was 100 feet, but 84 ft. the width now decided on, is a good instalment, and will greatly exceed that of any other metropolitan bridge. The arches are not to be two or four centred, but in a continuous curve, reminding us of the bridge of Santa Trinità at Florence. The piers however will be far less bulky than in that celebrated example. A portion of the structure will, it is hoped, be opened towards the close of this year, if no unforeseen difficulties should arise. Mr. Page's designs for the construction of the bridge have been subjected to very severe criticism, as may be seen by the minutes of evidence taken by the last Committee of the House of Commons which sat on the subject, but which reported in Mr. Page's favor. The design exhibits so many novelties and ingenious contrivances that the profession cannot fail to watch with interest the engineer's proceedings, and wish him every success in conducting his responsible undertaking to a close. Before I conclude, there is one point to which I may be expected to allude, namely the professional remuneration of my father as architect of the New Palace, but the whole question has been so recently before you, and the agitation of it at all was so distasteful to him, that I shall only briefly allude to it here, to state on the authority of a Treasury minute, that their lordships considered it "liberal" to force on an unwilling recipient a scale of remuneration less than is enjoyed by those of equal standing, whether engaged on public or private works; and that they thought it "fair" to avail themselves of the power possessed by a Government to refuse any reference of the case to an impartial authority, though they invariably concede such a privilege to tradesmen whose accounts are disputed. The contractors engaged upon the work have been very numerous, and I cannot now name more than those principally concerned, Messrs. Grissell and Peto, and afterwards Mr. Grissell alone conducted the works up to 1852, after which Mr. Jay undertook the contract, which he is now carrying out in a manner thoroughly satisfactory. Messrs. H. and M. D. Grissell have executed a great part of the iron-work with their usual excellence, and Mr. James of Broadwall has carried out the iron roof of the Clock Tower, and some other parts of the iron-work since the beginning of Mr. Jay's contract. When I have said that Messrs. Hardman have supplied the ornamental iron-work and stained glass, Mr. Crace the decorations, carpets, curtains, &c., Messrs. Gillow the furniture, and Mr. Minton the tiles, I have, I believe, described the most important contributors to the work under my father's direction. Mr. Crace has taken great pains with the upholstery, &c. which he has executed to my father's entire satisfaction, but these matters as well as the furniture are now being carried out (designs included) by the Office of Works, and are altogether removed from the control of the architect. I must not forget that the greater part of the hot-water pipes, boilers, and kitchen fittings, have been supplied by Mr. Jeakes, who well understands all such arrangements. Mr. Robert R. Banks was my father's Chief Assistant, and very ably carried out his views during the earlier years of the New Palace, and until he entered upon his present partnership with my eldest brother. The post of principal Clerk of the Works has been filled for many years by Mr. Thomas Quarm, whose skill and energy in conducting the works could not I believe have been surpassed. The elaborate scaffoldings of the towers have been carried out by him partially under the direction of Mr. Meeson, in whose great constructive ability my father has always had the highest confidence, and to whom he entrusted the principal management of such matters; and I think the fact that there has not been a single accident in carrying out the works due to the building operations, indicates no ordinary skill in those who have been responsible for their direction. Those of my hearers who have noticed Mr. Quarm's recent scaffolding at the Clock Tower, will, I am sure, admit that there has been plenty of scope for ingenuity in such arrangements.

I have now very imperfectly completed my task of describing the New Palace at Westminster, and my wish has been not to forestall your judgment upon it, but to place before you some of the materials for forming a correct opinion for yourselves. An architect is generally considered by the public to have every thing his own way, and is visited with a censure of aught that displeases directly proportioned to his supposed omnipotence. The time is not yet come for a full and complete history of the whole subject of the New Palace at Westminster; but when the many difficulties which have environed the work are borne in mind, as well as the numerous masters under whom it has proceeded, it must, I think, be admitted that the architect has some right to expect that the criticism on his production, however severe it may be, should at least partake of a discriminating character. It is not for me to enter here upon questions of taste, which it would be most unbecoming on my part to discuss. The building stands a great fact, and will be calmly judged eventually on its merits and defects by posterity, whose verdict it is worse than useless to attempt to forestall, and who will probably remember that it was nearly, if not quite, the first attempt on a large scale to revive Gothic architecture as applied to civil public purposes—that it was erected in less than twenty years, and by a single architect.

Mr. M. Digby Wyatt, Hon. Sec., said that, although a junior member only of the profession, he rose, as being to some extent the organ of the Council, who felt that, however desirous and indeed properly impatient the meeting might be to pass a vote of thanks to Mr. Edward Barry for his eloquent and interesting paper, there was another duty which must take precedence even of that. It had been warmly felt by the Council that a resolution should be passed, if the meeting thought fit, expressing in some degree the high sense which it, and the architectural profession generally, entertained with regard to the great work which had been described. He would therefore move "That this meeting desires to convey to Sir Charles Barry, through his son Mr. Edward Barry, whose admirable description of his father's greatest work they had this evening heard, an assurance of their profound admiration of the zeal, energy, taste, knowledge, and capacity displayed by him in the creation of the great national work he has now brought to a proximate conclusion. It desires to offer him their sincere congratulations upon this occasion, and to express the hope that with renewed health and strength he may long survive to receive the honour and respect to which he is so justly entitled, not only from his professional brethren but from the public at large." (*Loud cheers.*) If the proposition had not been so warmly accepted by the meeting, Mr. Wyatt felt he might have urged many pleas in its support, but after the glowing reception it had met with, he did not think a single word more was necessary.

Mr. Ashpitel, Fellow, felt very great pleasure in seconding the resolution. But one word more should be added to it by him, and that was to express the personal respect which every one who knew Sir Charles Barry must feel for him, and their appreciation of the kindness with which he had always treated every member of the profession. (*Cheers.*)

The Chairman, Mr. G. G. Scott, V.P., said that he would not put the motion in the ordinary way, but would beg the meeting to pass it by acclamation. (*Carried with loud cheers.*)

Mr. J. G. Crace, C.V., hoped that, having been employed by Sir C. Barry in a very humble way to assist in carrying out the magnificent monument which his son had so well described, he might be allowed to to make a few observations. He had himself received so much kind encouragement from Sir C. Barry at various times, that he could not remain silent on the present occasion. He could testify to the great anxiety which Sir C. Barry had felt on all occasions as to all the details of this magnificent work. He could speak to what was not known to all—to his anxious care, and to his working by the midnight lamp, and in the early morning, to devote the utmost thought and care in raising up a monument which should speak to future times ; and he could also speak to the high degree of art and skill which Sir C. Barry had assisted in producing in the various branches of decorative art. By these means Sir C. Barry had raised up a school of artists, which had caused England to obtain a character for art in foreign countries which she would not otherwise have possessed ; for, he thought it would be admitted by foreigners that the Gothic style was better understood in this country at the present day than in any other country whatever. But what he felt most was a sense of burning indignation, when he read the mistaken and disparaging remarks which had been made by members of the House of Commons,—in that house which Sir C. Barry had himself provided for them,—without caring for their accuracy or inaccuracy, and that those remarks should have been allowed by others who must have known better to pass, without their springing forth to explain the mistakes that were made. He could not help contrasting those remarks with the words of a truly noble man—a foreign Ambassador—the Count St. Aulaire, who was so much struck on viewing the Houses of Parliament that he exclaimed, "*je me sens humble,*" "I feel," he said, "my own humility in the presence of such a monument of science and art as I now see." He (Mr. Crace) hoped he should be excused for having expressed these sentiments, which had hung upon his mind for many a day, and for occupying the time of the meeting in expressing his respect for the great talent displayed by Sir Charles Barry in this magnificent structure.

Mr. T. H. Wyatt, Fellow, moved the thanks of the meeting to Mr. Edward Barry. He called upon them to express their cordial appreciation of the clear, eloquent, and modest paper which that gentleman had read, and to testify their cordial approval of the value and interest of such a practical and sensible communication. Having been for a short time the master, if he might say so, of Mr. Edward Barry, he could bear testimony to his great ability, zeal, and exertions.

Mr. E. C. Hakewill, Fellow, hardly knew whether it was more difficult to speak or to be silent on such an occasion as the present. He would, however, venture to add one word of congratulation to Sir C. Barry, and if any excuse were required for his doing so, he might say that he was himself a competitor with that great architect for the same work, which had been now described; but he rejoiced in his success, and considered it a great privilege to be present to offer his congratulations to Sir C. Barry on its near completion. Another source of congratulation in which all must join, was that his sons had grown up around him, and were ready to carry on his name and fame for at least another generation. (*Cheers.*) He seconded with pleasure the vote of thanks to Mr. E. Barry.

The Chairman could not put the vote to the meeting silently. It was impossible for any member of the profession, and particularly any one whose attention had happened to be turned to the Gothic style of architecture, to see the New Houses of Parliament brought to their completion without considerable emotion, and without a feeling of joy at the great success which had attended the work; and at the present moment, when the whole profession had been filled with sympathy for the severe illness from which Sir C. Barry was just beginning to recover, their feelings must necessarily be much stronger than at other times. At such a moment they could not but join most heartily in the congratulations expressed in the motion proposed by Mr. Digby Wyatt. The criticisms which had been alluded to by Mr. Crace were of course to be taken for what they were worth—somewhere about nothing. Posterity, as well as the present generation, would decide the question of the merits of this great work. No other building of the present, or of the last three or four centuries, could be compared with this, either in respect to its magnificent towers, its internal finishing, or its adaptation to the multifarious wants it was intended to supply. Moreover, the manner in which the subsidiary arts had been carried out by Mr. Thomas, Mr. Crace, Mr. Minton, Mr. Hardman, &c., was most remarkable, and there certainly was no other building in which such a coruscation of these subsidiary arts had been displayed.

Mr. Crace, C.V., further observed, that great benefit had been derived by the application, in the Houses of Parliament, of the true principles of decoration in metal work, especially in gas fittings, in the general lighting of the building, in ornamental iron work, carpets, paper-hangings, furniture, and every branch of Mediæval ornament. The theories on which this system of decoration were based first came into definite practice when this great building was in progress; and it was there shewn that the principles were sound and capable of being carried out more ornamentally and beautifully than the false principles previously in vogue. The Houses of Parliament were commenced before these principles were re-discovered or re-introduced, and their application to a building of such great importance carried conviction to the mind, and shewed the value of their introduction. He did not claim for Sir C. Barry the introduction of these principles, but he had acknowledged the truth of them, and carried them out; and every one must acknowledge the great improvement in the manufacture of these branches of art which had ensued from their being put in practice in so prominent a place.

Mr. **Burnell**, Associate, having made an enquiry respecting the process of preserving the stone work—

Mr. M. D. **Wyatt**, H. S., proceeded to read some observations by M. Szerelmey on the attempts made by him to prevent its decay in the building. It appeared, however, that the process had not been patented; that it was therefore a secret, and that M. Szerelmey should not be pressed too closely upon the subject.

After some discussion, Mr. **Digby Wyatt**, in order to recall the meeting, which, in entering into such technical details, had, he conceived, rather deserted the subject of the evening—Sir Charles Barry's great work—ventured to offer a few observations with respect to it.

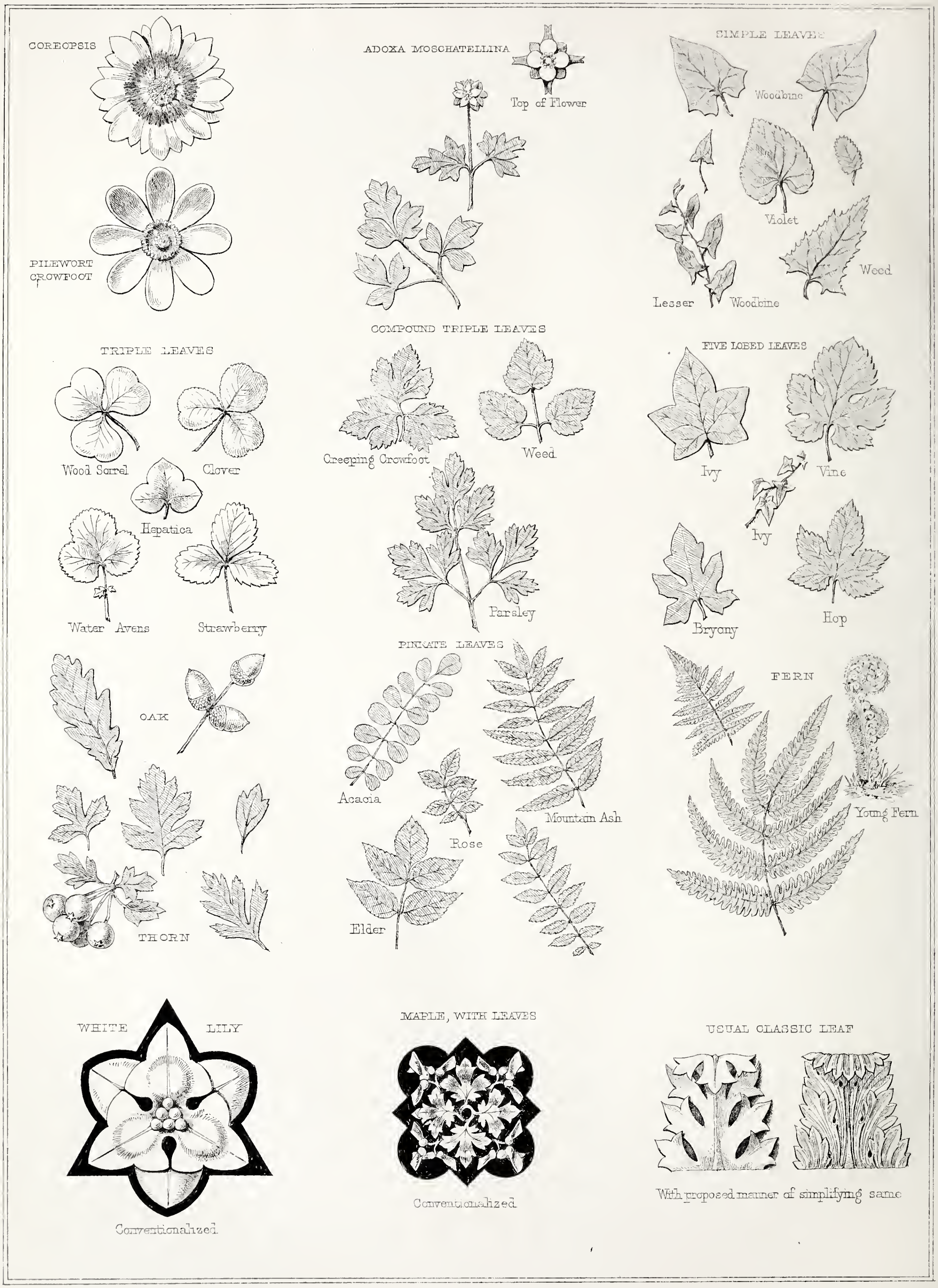
When any object was placed too near or too far from the eye of the observer, it was always difficult either to test its scale, or determine its real merit. This was strikingly the case with the general estimation in which architectural monuments have been usually held during the life-time of those who have produced them. They were like historical events and political changes, not to be properly appreciated till long after their occurrence, or introduction. The great incidents of youth were rarely correctly judged, even by wise men, till "time had thinned their flowing hair." Hence arose the difficulty of realising the importance of such a great work as the New Palace at Westminster. If they could now summon before them the architects of Cologne, Strasburgh, or any of our great English Cathedrals, or even the sons of those architects, to recount the difficulties and struggles undergone in the working out of those master-pieces of art, surely all must acknowledge that it would be most interesting to every professional man; and now, when they considered the skill and ability displayed in the New Houses of Parliament which had given to every individual feature its useful purpose, and graceful proportion—when they reflected that in all that mighty maze there were a plan and method without feebleness or an awkward bringing together of parts anywhere throughout the structure, they must feel it to be a gratification and a privilege that the architect should be yet living in their own days to see its completion; and that, in his very life-time, his son should be before them to tell them how it was done, and to answer any questions they might wish to ask with regard to any portion of it. With the construction of all great architectural monuments, all the other technical arts of a country commonly made a great stride. It was so in the case of the Parthenon, of Sta. Sofia, of Cologne Cathedral, and all the great works of antiquity, the Middle Ages, and those of the Renaissance. The triumph of all the minor technical arts was involved in that of architecture, and this was the reason why architecture might fairly be looked upon as the father of the other arts—enlisting the others in its train, and counting it one of its greatest privileges to develope them. Power could only be correctly tested or measured by resistance; and it was only by considering the obstinacy, prejudice, selfishness, and sad illiberality which Sir C. Barry had had to encounter, that they could measure the energy and the intense ability by which alone he could have carried his great work through, and lived to tell the tale, and reap his due harvest of laurels, if not of lucre.

Mr. T. H. **Lewis**, Fellow, wished to know to what extent Sir C. Barry had been able to carry out those views of colouring and internal decoration which he had expressed in the extract read by Mr. E. Barry.

Mr. E. **Barry** said that he had already enumerated all the decorations actually executed. The decoration now rested entirely with the Fine Arts Commission.

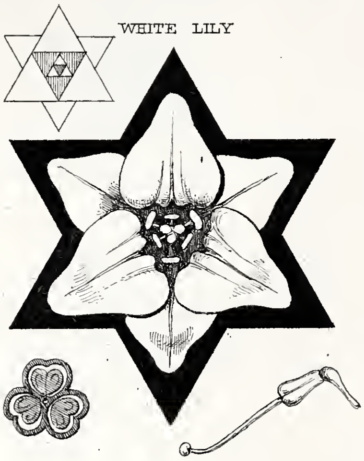
The **Chairman** said that, although it was perhaps considering the subject in too low a light, he should like to mention the question of cost, on which an immense deal had been said. He had been assured by Sir C. Barry that the cost of the Houses of Parliament, with reference to their cubic contents, had been in fact less than that of any other public building in the country. This was the more remarkable, considering that the stone used was of the hardest description, that there was not a shabby bit in the whole building, inside or out, that the joiner's work was of the most superb character, and that the style of architecture was carried out in its fullest integrity. He had only now to convey the thanks of the meeting to Mr. Barry, and to express the personal regard which they must all feel towards Sir C. Barry—their sympathy for his late illness, and their gratification at its happy termination; together with their hope that his life might be spared to see his glorious work long after its completion.

The meeting then adjourned.

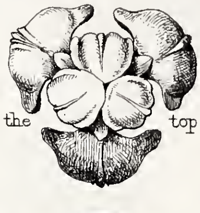


Day & Son Lith^{rs} to the Queen

WHITE LILY

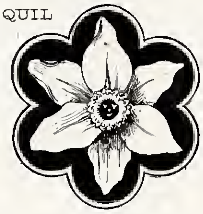


IRIS OR FLEUR-DE-LIS



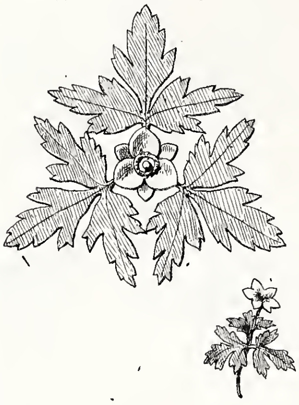
Looking on the top of Flower

JONQUIL

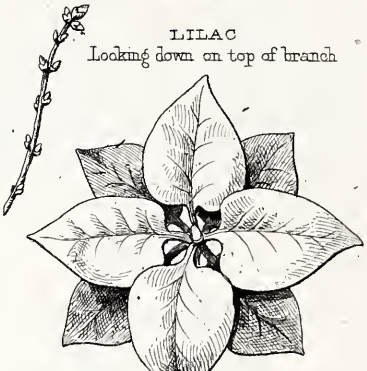


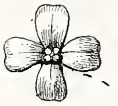
IRIS OR FLEUR-DE-LIS

WOOD ANEMONE



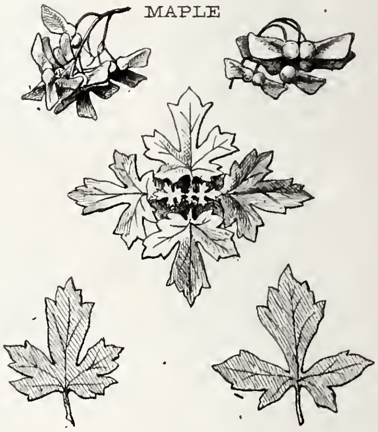
LILAC
Looking down on top of branch





WALL FLOWER

MAPLE



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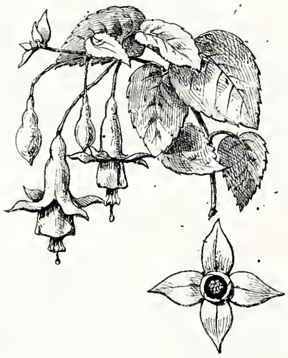
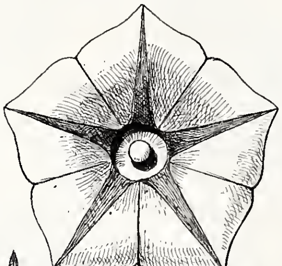
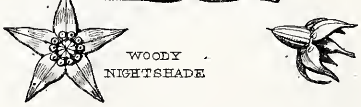


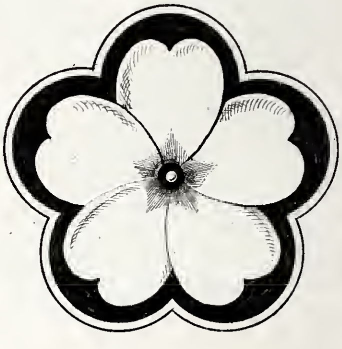
CONVOLVULUS



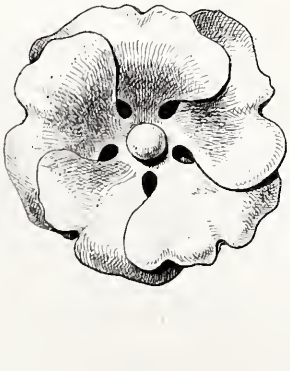


WOODY NIGHTSHADE

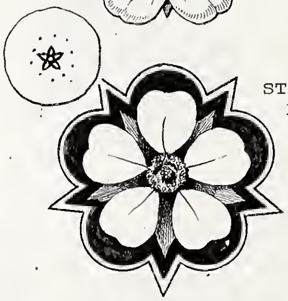
PRIMROSE



HOLLYHOCK

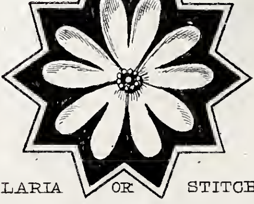


APPLE BLOSSOM



STRAWBERRY BLOSSOM

CAMPANULA



STELLARIA OR STITCHWORT

Day & Son Lith.rs to the Queen

ON NATURAL AND ARCHITECTURAL FOLIAGE.

By J. K. Colling, Associate.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, February 8, 1858.

From the time of the Egyptians and other ancient nations down to the present, decoration in architecture has been taken almost invariably from animal or vegetable life. The human form, as the perfection of natural beauty, was dwelt upon with delight, and idealized by the artists and sculptors of old, whose works will, for their transcendant merit, be guarded as treasures of art to the end of time. The inferior animals also had their share of attention until the inanimate stone and marble were made to assume, by the aid of the chisel, a life which will long endure to instruct and delight. In these works man has always been fond of trying to create, instead of merely copying; he has not been content to take nature as he found it, but has made his statues superior to himself, culling all the beauties and omitting what he considered faults. In numberless instances he has created new beings of his fancy, by blending and amalgamating animal and even vegetable forms with the human; birds with animals; animals with fishes,—nothing, in short, has been left untried to elicit new beauty by new inventions. But apart from the higher class of sculpture, should the Architect be fortunate enough to be able to introduce it, there is still a vast field of decoration, the clothing, as it were, of architecture, which has been invariably taken from the vegetable kingdom; and although it is of an inferior class of sculpture to that which embraces animal and human forms, architecture depends greatly upon it for its beauty of expression and loveliness to the eye.

Nature, indeed, teaches us a useful lesson in decoration, for where not prevented by man, she enriches and decorates nearly every portion of the earth with beautiful foliage, such as is best suited to the spot, and characteristic of its position on the globe. So it was until modern times with architecture. The Egyptians copied the papyrus and the lotus which grew in profusion on the banks of the Nile; the Hebrews the pomegranate and the almond, common in their land: thus the robes of the high priest were decorated with pomegranates, and the seven-branched candlestick was expressly modelled from the almond, each branch "with his knops and his flowers." The Greeks designed their foliage from the acanthus and honeysuckle; the Romans from the acanthus, the vine and the laurel,—and we should take, not the foliage of other lands, but like our fathers of old, the foliage of our own, and make our architecture characteristic of ourselves and our country, by using the thorn, the maple, the oak, the thistle, the briar and rose, the clover and fern, with all the countless and simple leaves and flowers which so luxuriantly enrich our fields and hedges.

Now although sculpture in its highest branches has been closely followed by modern English artists until such names as Gibson and Bailey have gained a world wide reputation; yet sculpture of a lower class,—architectural sculptured decoration has been woefully neglected. It has not been considered worthy of attention, but has been treated as beneath the notice of the artist, who has aimed entirely at the highest class. Classic and Mediæval foliage has been looked upon as perfection, and the architect instead of designing has been content to take it as he finds it—merely copying out of some book, or leaving it altogether to the unskilful hands of an ordinary workman, to whom he has perhaps given a few *squeezes* from which to copy. But of late years the necessity has been pretty generally felt for making new designs for foliage and endeavouring to strike out something fresh, instead of resting satisfied with copying and recombining from that which has been handed down to us. It has been at length acknowledged that we must again have recourse to the fountain head—nature—from which all conventional forms of foliage were originally derived; and I believe it is generally allowed, that we cannot proceed far in the pursuit of beauty without her aid. All that we see most to admire in the foliage of the Classic or Gothic eras can be clearly traced to natural forms and natural arrangement, and by studying how nature has been hitherto followed we are enabled to perceive how to improve or vary our ideas, and to take advantage of other beauties which will be sure to spring up before the eyes of the diligent student. Probably in pursuing his studies he may find much that is exceedingly simple and not new, still as every arrangement, simple as it may be, forms one in a a regular chain of natural development—and, as it is in following up this chain and supplying by degrees link after link, that he gains that true feeling and knowledge of those natural laws of which he is in search—nothing should be considered too commonplace for study and examination.

The geometrical arrangement and form of flowers are very interesting and beautiful. Flowers which radiate from a centre are arranged upon the triangle, the square, the pentagon, the octagon, and other regular forms, and the precision and regularity with which this disposition is sometimes carried out is very remarkable. Several diagrams of flowers of this kind are before us, which I will now proceed to explain. The common white lily is formed upon the triangle, and when viewed directly in the centre of the flower its general form immediately suggests the six-pointed star, with which I have surrounded the flower in the diagram. Commencing with the seed vessel situated at the bottom of the flower (and which is the very centre of all), we find it arranged in three heart-shaped cells, as seen in the section through the seed vessel, shown on the left of the diagram: each cell contains two seeds (it contains in reality a great many more, but two in each cell, that is one layer, are all that can be seen at one time in section); from the seed vessel springs the style the end of which is again triangular, answering to the cells of the seed vessel. The general appearance of the seed vessel or pistil, after the petals have fallen off, is seen at the right of the diagram, and in the centre of the diagram of the flower the triangular end of the pistil is again seen, around which are arranged six stamens in two triangles of three each, the first three alternating with the pistil, the second three alternating with the first. This is better elucidated by the figure at the top of the diagram. Outside the stamens and alternating with them issue in a bell-like form, the first set of three petals, and alternately with them the second set, which completes the flower. Nothing could be arranged more simple or graceful, nor could anything be more appropriate than the selection of this flower as the emblem of purity. The general bell form which is not shown in the diagram is also well worthy of study.

There are many other flowers which are arranged on the same principle as the lily—as, for instance, the crocus, the snowdrop, the daffodil, the tulip, the wood anemone, the jonquil and the iris. It is perhaps somewhat singular that they are nearly all early spring flowers—the crocus and snowdrop being the very first to thrust forth their blossoms to show us that winter is departing—thus appearing to answer to their simple and primary arrangement upon the triangle, the first geometrical figure. The lower figure in the next diagram shews the arrangement of the jonquil with two sets of petals as in the lily. These were the type for flowers in Gothic architecture in diaper work, spandrils, and many other positions where the triangular arrangement is most suitable. There are numerous examples of the triple arrangement, which was always, from its emblematical meaning, a favourite among Mediæval architects. In the iris or fleur-de-lis there are six petals as in the lily; three turning upwards and meeting together in the centre, while the other three turn downwards and give the lower lobes of the conventional fleur-de-lis, shown on shields or in painting in the flat, consisting of three parts only, the centre and two side lobes. It is often executed in this manner when isolated and in metal work, the triangular formation with all the six petals as in nature, which could not fail to add much to its beauty, not being preserved. In the wood anemone we find a very elegant triple arrangement. The natural flower has an involucre of three leaves, issuing at one point about 2 inches below the flower, which, when seen from above, presents the appearance shown in the diagram. The flower consists of six petals alternating as in the lily. This alternating of one series of petals with the other, and of the leaves of the stem again with the petals, and also with each other, is a universal law in nature, which, except from accidental circumstances, is scarcely ever departed from. The involucre surrounding the flower is formed of three triple leaves, each leaflet being again subdivided into three—the points into three again—the side points into two. The flowers of four petals are not numerous; most of them are very small, and often appear in bunches and clusters, forming the natural order of Cruciferæ, and are the flowers of the cresses in our gardens. The wall flower is one, but perhaps we see the cross form better in plants and trees having opposite leaves. That is, a pair of leaves issue from the stem at the same level but from opposite sides—the next pair growing at right angles to them, so that when we look upon the top of the branch it presents the cruciform arrangement shown by the branch of lilac—which is a natural representation of a branch as seen when looked down upon. The arrangement of the buds is shown at the side. There are many other plants and trees which grow in the same manner—as the maple, of which a diagram is given, seen upon the top of the branch—the privet, the ash, the horse chesnut and nettles, besides many others. The most common arrangement, however, is that of leaves springing out alternately from the stem, as in the oak, the thorn and a vast number of both trees and plants. The fuchsia, which is a very elegantly formed flower, often hanging in very graceful, pendulous clusters, has also a cruciform arrangement; the most ornamental portion, however, of this flower is the calyx, and not the corolla as is usual. The flower, as seen by the eye looking up, is shown in the lower corner of diagram. The leaves of this plant are also opposite. The cross form seen in opposite leaves is probably the type of the four leaved flowers in diaper work, cornices, and bosses of the fourteenth century. The drawings of two bosses show conventional arrangements from the lilac and the maple, the latter having the key seeds brought in at the angels. By far the most common number of petals in flowers is five, as in the common briar and dog rose. In the garden convolvulus the pentagonal form is very beautifully developed by the general form and the scarlet five-pointed star on the rich purple ground—but the flower is not divided into separate petals, being "monopetalous," that is, in one single bell or rather trumpet shaped form. In the woody night shade, which is a small purple flower with a yellow centre, the five-pointed star is most mathematically developed. The points are laid flat in the diagram—the natural representation of the flower as it grows is shown in the right corner. The primrose has five heart shaped petals of a pleasing form. The hollyhock has five petals joined at the base, each deeply overlapping or revolving one upon another—when in the bud they are quite screwed round. The apple blossom consists of five petals with the green calyx behind just appearing between the petals. The section of an apple shows how the pentagonal form is still carried on in the arrangement of the seeds. In the strawberry blossom five delicately white heart shaped petals are barely attached to the centre, shewing the five green points of the calyx very plainly between them. In the campanula, or bell flower, we have a very elegant pentagonal form, and in the double one, as in the diagram, a ten pointed form. In the stellaria, or stitch wort, we get a very star-like form, as its name indicates—each of the five petals being nearly divided to the centre into two parts. The coreopsis has eight petals, each with triple ends. The pilewort crowfoot has also eight petals. The last flower to which I would draw your attention is the moschatell, or adoxa moschatellina, a rather long name for a little simple weed which scarcely grows more than 2 or 3 inches in height, and the flower is almost imperceptible from being nearly of the same colour as the leaves. It however deserves minute attention from its very curious construction. It has five small flowers joined together in one head; four of them, of five petals each, are set in the form of a square, and upon them, on the top is set another flower of four petals only. The leaves, which are triple, are of very elegant form, and each leaflet is again subdivided into threes.

It may be supposed from my bringing such an array of natural flowers and leaves before you, that I am advocating a literal translation of them for the purposes of architecture, and that I wish all foliage to be strictly natural. Nothing however can be further from my intentions. Natural foliage, however well rendered or cunningly carved, if merely copied from nature without being translated by the mind of the artist, will fail entirely in its purpose, and be less effective than the literal copyism of the foliage from any of our architectural precedents. This cannot be too strongly insisted upon, because if we tell our artists that they should not copy from old examples, but simply say, as it has often been said, that they should "go to nature," we shall soon be so deluged by literal representations of natural foliage that this system of copyism will become worse than the first. In the rendering of natural into architectural foliage there must be study and thought—life and beauty. It must be the creation of the artist's mind, working upon nature's principles and nature's laws.

The purpose of these diagrams is to show that nature is ever fruitful in change, combined with the utmost simplicity—while in modern ornament, the reverse is the case, and there is constantly a want of change with the greatest intricacy. We see also that nature is constantly regular and geometrical. What can be more in accordance with architecture? We can alter and conventionalize in any manner we please. We need not copy, for we can produce changes by substituting leaves of various forms for the simple petals—thus we can substitute the triple leaf for the plain petal, or put leaves together after the manner of flowers, as we see in nature when looking on the top of branches, such as the lilac and maple. Great prejudice exists among many against adopting the natural form of a leaf, and many architects extol what they choose to call "purely conventional foliage" as being far before the natural—although really all must be natural that retains any character worth preserving.

In the treatment of foliage several things must be considered—in the first place, the general arrangement of the leading lines, which must be purified from all inelegant forms, and be such as will best harmonize with the architecture which surrounds the composition. Next, the material, its texture and colour, and the breadth of form and depth of cutting must be suitable to it. What is suitable and appropriate for a rough-grained stone will not answer for a fine one, and so on. Then the position is to be remembered, and whether the architectural member which the foliage enriches requires it to be of a flat character, or otherwise. What is suitable near the eye must be simplified according to its intended distance or height. Then the light and shade must be studied, which must above all be carefully and duly balanced, while the form of the leaves and foliage requires the greatest consideration; and as among natural leaves and flowers we find some of the most pleasing and elegant forms which can be conceived, it is perfectly legitimate to take advantage of them. For example, it is utterly impossible for man to invent a more elegant form of leaf than that of the maple, yet whilst applying it to his own purposes, it is not at all necessary to adhere strictly to nature. It can be made more symmetrical and regular, until it becomes a purely architectural leaf, based only upon that of the maple. The first time that I observed such foliage, now nearly twelve years ago, was at Southwell Minster, when I caught sight of the ornament in the arch of the doorway leading to the Chapter House through an open window, and I was so struck with its delicate crispness of form, and its wonderfully artistic balance of light and shade, that I have a vivid remembrance of its effect to this very moment. It had no confused appearance, no straining after light and shade by the contortion and twisting of the surface of the foliage, nothing to disturb the repose of the architecture; all was bright and sparkling, teeming naturally with the life stamped upon it by the hands of the mason nearly six hundred years ago. It is not a literal copying of nature, but there is life transplanted there from the very hedges and fields, that surround that old Minster, which still continue to burst forth in Spring, and to develope and expand the same forms which were expanded under the eyes of the workmen of this very doorway. We can still see there what these old masons admired, the beauty they sought after, and how they have shewn in stone their love of their native land, and of their own simple native foliage. The very stone has written upon it, "My son, your fathers have wrought thus with their hands, go thou and do likewise,—copy not our works, but go to the source which thou seest we loved —study as we studied the works of thy Creator; and, moreover, make thy work characteristic of thy country, which thou should'st love, and thy day which thou should'st stamp as thine own." What would it have been if these old artists had worked as we have been working, literally copying Greek and Roman foliage—exotics which do not belong to us? We should have seen nothing to admire, but rather a puzzle for the antiquary, as our own age probably will be in six hundred years time, if any of the modern classic work lasts so long.

The forms of leaves vary from the most simple to the most complicated,—yet even in the most complicated, there is such a simplicity and beauty of arrangement that they can be often altered or adapted in the most happy manner to suit the purposes of the carver, without losing sight of their natural formation. Briefly to explain, I would refer to the diagrams of leaves. First, we have simple forms, as in the woodbine, the lilac, the violet, and many others; next we have the leaf divided into three pointed lobes, as in the hepatica—three round lobes, as in the water avens, or herba benedicta, which is said to be the type of the early English foliage; then we have the three distinct leaflets, as in wood-sorrel, clover and strawberry; and three three-lobed leaflets, as in the creeping crowfoot; and while in the parsley leaf this triplicity runs into the greatest apparent intricacy, still it is nothing more than the same principle carried to a greater number of divisions. First, there are three stalks which bear each three distinct leaflets, divided into three lobes, each lobe again divided into three. Much the same arrangement is seen in the leaves of the moschatell and wood anemone, to which I have already referred, but they are less divided than in the parsley. Thus we see a natural principle of continually dividing and sub-dividing into threes, which is not confined to one particular plant, but runs, in various ways, through a large number, any part of which we can adopt or modify for our purpose without copying from any one leaf in particular. Other leaves are divided into five lobes, as the ivy, the maple, the vine, the bryony, and the hop,—these run again into sub-divisions, in the same manner as the triple leaves. The oak and the thorn present a wonderful variety of forms in themselves, the thorn having sometimes three lobes, five lobes, seven and even nine lobes; and in the thistle, we get a leaf of a beautiful sharp and pointed form, which is cut into many lobes. Another kind of leaves are those which have a number of simple leaflets, in pairs, upon a central stem, with an odd leaflet at the end (called pinnate), as for example, the elder and the rose, which have five or seven leaflets—and the acacia and the mountain ash, which have a large number—somewhat after the same manner are the ferns.

I would point out that there are certain natural principles and forms running through both leaves and flowers—that they follow a regular geometrical distribution of parts, and that the form of the leaf or flower follows naturally from the principle, or, if I may so say, the anatomy upon which it is set out—thus flowers radiate in threes, as the lily; leaves grow in threes from the same point in the stem, as the anemone; leaves divide and sub-divide in threes, as we see carried to the greatest extent in the parsley. Flowers again are cruciform, as the wall flower; leaves also grow with the same arrangement, as we see in the lilac and the maple. Flowers are very commonly divided into five petals; leaves are divided into five lobes with a semi-radiation, simply cut out as the ivy, divided with eyes as the vine, which we see again in the flower of the hollyhock. The lobes deeply divided as in the maple and the bryony, or sometimes separated into distinct leaflets as in the horse chesnut and the Virginian creeper. Then we see the leaf take leave of radiation and branch as in the rose-leaf, which is carried further in the acacia and the ash, and is again sub-divided in the ferns. In the leaflets of the acacia we see also the heart shape which we observed in the petals of the strawberry and the primrose; also again in the leaf of the violet, but formed the contrary way.

All these facts show that there are certain natural laws, by studying which the artist can produce what form of leaf may best suit his purpose, but without following any one leaf in particular; thus giving him such a vast field to work in that there need be no limit to genius or invention.

In the foliage of the best periods, as in the oak stall work at Winchester and Wells, and in the little Chapter House at Southwell, the outline and form of the leaves were carefully attended to, and, in spandrils and other panel surfaces, always arranged in a flat manner. The surface carving upon the leaf was made quite secondary, and never sufficient to interfere with or disturb the flat surface which it enriched. If a leaf is beautiful in form, it requires no violent undulation upon the surface, or deep gashes and lines cut upon it to produce light and shade; such a system defeats the object of the artist, the form of the leaf is lost, the high lights become small and thin, the shadows behind the leaf become mixed in effect with those upon it, and the whole has a disagreeable confused effect. Yet this is the system of modern carving, be it Classic or Gothic. It is bad and vicious from beginning to end, nothing is studied, nothing is thought of but vulgar, violent contortions, or abominable liny surfaces. I was told by a modeller who had been executing some foliage from my designs, and had tumbled it about like the sea in a storm—"if you want it all flat in that manner, I can easily do that—that's much easier for me, but I wanted to give you more effect." Our modern carvers are always talking about "effect," but seldom hit the mark. This was Classic work, but I have experienced equally unsatisfactory results in Gothic carving—parts were so turned and twisted that I scarcely recognized my own designs. The modern carver believes that all this contortion and deep gashes give effect—he will not let well alone, and the forms and lines which you study he buries in oblivion, giving nothing but unquietness where you sought repose and architectural enrichment. Set a man to carve a Corinthian capital and he cuts it up as shewn by the leaf on the right of the diagram. He takes the most complicated form he can find among ancient examples, and then proceeds to carve up the surface with innumerable deeply cut lines to make it "effective." The leaf on the left shows the manner in which I consider it should be cut—simplify the outline and then preserve it, do not bury it up again by manufacturing shadow upon its surface,—shadow is required behind the leaf and not so much upon it.

Modern carving then should be based principally upon nature, but we should take ideas from all that is most beautiful, from all periods and all styles of architecture, only let us not confine ourselves or copy from any. Its leading characteristics should be elegance of form and beauty of light and shade, whilst retaining all the quietness and repose necessary for its various positions as architectural enrichment. Let us all thus work together; let the sculptor and painter remember that architecture is their sister art, and render her willing assistance. Let the working man educate himself to become the zealous art workman. Thus let all endeavour with heart and hand to produce a style worthy of our age.

The Chairman, Mr. Kerr, Fellow, said, that the meeting had listened with great pleasure and attention to the explanation which Mr. Colling had given of the result of his study of natural foliage. The subject was a very interesting one in the present phase of architectural art, which depended so much upon a proper comprehension of the picturesque. There was certainly nothing in nature which exhibited the manifest intention of the designer so much as foliage and flowers. The beauty of a landscape might be said to be almost a matter of accident, but the beauty of a flower displayed the deliberate design of the Divine hand, exercised for the purpose of producing a special effect of pleasure in the mind. These works were peculiarly available to the artist, because, in the formation of them, their Divine Creator was carrying out the very process which the artist was called upon to carry out for the contemplation of other minds. In considering the purpose of the Divine designer in the forms of foliage and flowers, it would be seen at once that the leading ideas were variety and beauty. In respect to flowers (as indeed with all other natural objects) variety was attained by irregularity, based upon a system of regularity. Mr. Colling had pointed out that all natural productions were based upon what, for the present purpose, he had properly called geometrical principles, or geometrical forms. But there was another principle always at work in nature. Regularity was carried out with, he might almost say, invariable irregularity: as they had been accustomed to say at school, that there was not a straight line in nature: and in foliage there were two principles in constant operation; one being the regularity with which every object had been studied, the other the irregularity with which it was developed. Now in architecture they had the Classical or severe school of design, and the Gothic (or Mediæval) or picturesque school. The latter had variety with less regularity or unity than the former. The Classical school had unity, but less variety than the picturesque. He need not say that, in adopting the natural forms of flowers for architectural purposes, it was necessary, to a certain extent, to artificialize them; and in the Classical style this was more necessary than in the picturesque. The student of severe or Classical architecture (he did not apply that term to the Renaissance) would endeavour to conventionalise his forms into a perfectly geometrical development, whereas the student of the Mediæval style would study more particularly the picturesque which already existed in natural foliage. Mr. Colling had not happened to mention the question whether colour could be properly introduced in architectural carving, but no doubt he would have thought it only necessary to say, that as coloured sculpture was of no greater value as a work of art than wax work, so coloured flowers or foliage in architecture would not have that sculpturesque character which was required in architecture. Occupying the chair, as he then did for the first time, there was one observation made by Mr. Colling which he could scarcely allow to pass unchallenged, namely, that the architecture of the present day would be a puzzle to the antiquary of the future. The present was a *period* as well as other periods. It was a part of that *modern European period* which commenced (with what we call the revival of art) in Italy, in the fourteenth and fifteenth centuries, and modern architects generally were carrying out, more or less, the principles which were then first evolved—principles which must be carried out of necessity, until some other system should overthrow the present in its turn. They were, in fact, (when not copying) but carrying out the natural style of the modern European or Italian period, and in proof of this he was glad to see that the Gothic architects of the present day were coming nearer and nearer to the Italian style of treatment. The pains which Mr. Colling had taken to explain the natural forms of flowers and foliage were very creditable to him. It showed that the anatomy of botany was a subject particularly worthy of study, as it would show the principles upon which natural foliage had been designed. There must be a law in this subject as well as in everything else, although they might not be able to dive so deeply as might be wished into its principles. Nature was infinite in its variety, and therefore by laying before them for imitation this infinite variety, called upon them to carry that infinity into still greater infinity, if he might say so much without getting confused in metaphysics. In exhibiting to them the road to infinite variety, Nature called upon them most manifestly to progress in the same direction, and he was quite satisfied that no one would find the subject of botanical form other than exceedingly rich in respect to design and variety. The study of the anatomy of botany, as Mr. Colling had very properly observed, was the only thing which would produce *spirit* in carving. Some were apt to confuse carelessness with originality; a most fatal error, for carelessness never could be but antagonistic to originality. True originality must lead to study and care; the great end and object of all study being not to produce copyism, but to discover the principles upon which originality might be based.

Mr. COLLING said that he considered Gothic architecture embraced both the picturesque and the symmetrical. Most of the illustrations he had produced showed that the geometrical or symmetrical arrangement of ornament suited what he had been explaining quite as well as, if not better, than the picturesque; and he could easily conceive the same principle to be carried out through a noble Gothic building, to suit that style quite as well as it would the classic.

Mr. C. H. SMITH, H.M., said that as the only representative present of the body of Architectural Carvers he could not be silent on this occasion. With respect to the drawing of carving in Southwell Minster, referred to by Mr. Colling, it was carved in the same stone as that used for the New Houses of Parliament, and was one of the original examples to which Sir C. Barry and himself had paid particular attention. Their opinion (and the same remark was made by other architects) was, that although it was wonderfully well undercut, it was so exceedingly flat on the surface as to display little or no feeling. It certainly was not executed in the style in which he should himself have carved it. Mr. Colling's remarks on architectural carvers led him, Mr. Smith, to observe that, during the last thirty years, he had had a great deal to do with architects in reference to carving, and his experience was, that every one appeared to criticize and severely blame all that the others did, and what one admired another condemned. With respect to Corinthian capitals he had carved more than most people, and he never executed one without having a most minute and careful drawing to work from. In fact the detail was not left to the carver. In the case of one celebrated building in London, however, the architect had refused him a drawing, and had told him to copy the capital from the Arch of Hadrian, in Stuart's Athens. Notwithstanding his remonstrances against the outrageous projection of the pilaster capital over the shaft, as compared with that of the column, the architect paid no attention and still refused to look at the drawings: the consequence was that several of the capitals which were in progress were rejected, whilst the building presented some of the capitals as originally executed, and others after the discovery of the error; in some cases one of each came close together, and differed four inches in projection. He mentioned this to shew that the practical man, the carver, was not always to blame. The building he had alluded to was the National Gallery, and the difference in the projection of the capitals of the pilasters might be clearly seen by any person going from Pall Mall eastward. With regard to Gothic carving it was very rarely that the architect left it to the carver; although generally speaking he found that the public and the profession were most pleased with those works where the architect had interfered but little. Of course where there was a large amount of carving (as in Southwell Minster, and in the New Houses of Parliament) it was impossible for the architect to make drawings for the whole.

Mr. COLLING said that he had not intended to hold up the flat style of ornament from Southwell Minster as an object for imitation. He went upon the principle of copying nothing. He did not consider it indeed perfection, but his first impression had been that it was the most beautiful Mediæval carving he had seen. The remarks of Mr. Smith shewed the want of a class of artists who should take up architectural carving in a proper spirit, and independently of architects. He had already expressed his regret that sculptors had devoted their attention to the highest class of art and neglected architectural sculpture.

In reply to the Chairman, Mr. **Colling** stated that he decidedly advocated the simpler form of leaf in the Corinthian capital, as shown in his drawing; and he considered his opinion to be borne out by the successful effect of those in the new works at the Louvre. The leaf there was almost perfectly plain, receiving the full breadth of the light, which was not cut up by thin lines so as to be mixed up with the background which was intended to relieve it. Of course a proper medium should be preserved, and much would depend upon the height and position of the column.

Mr. M. D. **Wyatt**, Hon. Sec. rose to draw the attention of the meeting to the obligations they were under to Mr. Colling for his very suggestive paper; which was the more interesting, considered in connection with that which had been read at the last meeting on the New Houses of Parliament, and with the school of architectural carvers, which had grown into importance in the elaboration of that vast building. It was impossible for any careful observer of the progress of architecture in this country, not to feel some anxiety with respect to the influence those artist workmen would exercise upon whatever style of design might be hereafter inaugurated in this country. Numbers of the workmen who had been so long employed at the Houses of Parliament, and others no less dexterous, were now scattered about the country, and had been employed in ornamenting numerous parish churches and other Mediæval structures with sculptured decoration. Many details, involving in their successful execution considerable knowledge of both natural and architectural enrichment, were left to the actual design of these workmen, especially in country places; and it was, on that account, most important that sound principles should be recognized to serve as guides for them. It was, in this respect, that the subject of Mr. Colling's paper was exceedingly valuable at the present time. Every one must feel, with Mr. Colling and the Chairman, that the normal principle in nature's products of all kinds, was regularity. The perfection of its symmetry was indeed the test of the health and value of a plant, for the moment disease occurred, the regularity of the plant or flower was impaired. It appeared to him, however, that there was in nature a continual effort to escape from the monotony that would be engendered by a too prominent and constant assertion of a despotic principle. The operation of the laws of gravity upon the flowers or plants, and the wayward efforts they were continually making to reach the purest light and air, produced incessant counteractions to any too great severity of form in growth. The way in which leaves sprang from their stems, and branches from their parent trunk, showed, by their irregularity, a settled purpose in nature to assert her freedom from what would otherwise be too great rigidity and simplicity in the main geometrical forms to which she would be limited but for this gasping after liberty. Her favourite principles should be carried out with veneration in art, and thus designers should endeavour to contrast dominant geometrical forms with those on which the fancy of the artist was employed, either in direct or conventional imitative art. He agreed with Mr. Colling that it was by the adoption of the general principles of nature in connection with pure geometrical forms, in parts, and for contrasts, that they should obtain the best architectural rendering of foliage. The tyro commenced invariably with a tribute to the predominance of rigid order in design—with a central line, and equally balanced ornaments on each side. He soon found this too easy, and endeavoured to escape from such simplicity, degenerating into insipidity; but as he became master of greater resources in composition, he obtained an almost equal, but less obvious, degree of regularity, producing the happiest effects, and at the same time constantly concealing from the uninitiated the precise means by which the especial graces had been obtained. This was the practice of all the greatest painters. The best compositions of Raffaelle, the Cartoons for example, were almost invariably based upon some simple geometrical figure; but by the great dexterity of the management of subsidiary lines, of colour, and of the light and shade, there was a constant hiding of the first intention; and the spectator was pleased with an effect of order and balance of parts, although unable to trace without a happy and sustained mental effort, how such regularity had been obtained in what at first sight appeared so free and unartificial. The "ars celare artem" was indeed one of the most important branches of design, inasmuch as it involved the most perfect imitation, and at the same time forbade the artist's bringing himself conspicuously forward.

With regard to the extent to which the direct copying of natural forms might be allowed in sculpture or architecture, a great deal depended on the material employed. The imitation of the trunk of a tree in oak, or of rocks in marble, was objectionable; but a very close approach to direct imitation might be made where the object was enclosed by architectural forms obviously conventional, as in the case of the mouldings dividing the foliage at Southwell Minster. Although the foliage in that case was closely copied from nature, the fine projecting beads and rolls separated the ornaments from each other, and at once convinced the spectator of the architectural character of the work. Direct imitation of nature might also be allowed where the scale of the imitation was less than that of the original, because the difference of scale at once showed that the work was not a mere portrait, and it therefore lost its servile character. If they were to insist too largely upon convention, they would do away with one of the greatest and happiest privileges of the artist. No delight was greater to him than to bring eye and mind and hand to bear in imitating and endeavouring to re-produce in equal perfection any beautiful object which he might select; and in precise proportion to the pleasure felt by him in working was almost invariably the pleasure conveyed to the spectator by the beauty and perfection of the artist's imitation. The bronze foliage and little birds of the architraves of the gates by Ghiberti, at Florence, were admirable examples of the most conscientious transcribing of nature. It would be impossible for her to imitate herself more playfully and honestly than Ghiberti had done. There was not a plant in his work retaining its normal geometrical structure, and it therefore harmonized most agreeably with that infinite change and variety which are no less constant phenomena in Nature than the order and precision of her fundamental laws.

With regard to the application of colour to sculpture, Mr. Wyatt thought he must join issue with the Chairman. He agreed that party-colours were inapplicable to the highest class of sculpture, unless managed with consummate dexterity; but in ornamental compositions, where there might be two or three systems of lines, interwoven with others in different directions, the intersections recurring at regular intervals, there could be no objection to the application of various colours to each system of lines; and if it were desired to place ornaments in different parts of the spaces formed by the intersections, those ornaments might also be uniformly coloured, so as to give the effect of regularity by repetition. With regard to any such applications of colour, they must obviously vary according to locality;—thus it was evident that, in a ball room, a much nearer approach to what the Chairman termed "wax work," might be allowed than in a church, or other building devoted to more serious purposes. If, indeed, sculpture were introduced into any highly decorated building, and from such it could scarcely be banished with propriety, it would be unwise not to carry some degree of colour into it, so as to bring it into harmony with that by which it might be surrounded. Mr. Wyatt concluded by proposing a vote of thanks to Mr. Colling for his highly interesting paper, and for the beautiful diagrams by which he had illustrated it.

The vote of thanks was carried unanimously, and the meeting adjourned.

"ON WATER SUPPLY TO TOWNS."

A Communication from Sydney Smirke, A.R.A., Fellow.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, Feb. 22nd, 1858.

79, Grosvenor Street,
February 22*nd*, 1858.

Dear Sir,

Permit me to invite the attention of the Members of the Institute for a few minutes to a subject—humble, indeed,—most unattractive, and most anæsthetic, yet a subject which, being of great economic and sanitary importance to the public, need not be considered unworthy of the attention of any man, still less of the Institute of British Architects.

In very few large towns are the inhabitants able to indulge in the use of an *unlimited* quantity of water. The wasteful, and indeed, dishonest, practices of many often preclude the possibility of this indulgence, even when the natural supplies of water do not set a limit on its use.

In places, as in London for example, where the service of water is necessarily confined to a short period, daily, it becomes a matter of very great importance to provide in each dwelling receptacles large enough to meet liberally all the reasonable wants of a family for at least twenty-four hours: there are in truth few provisions of equal importance to public health and comfort. Yet, I believe, that an enquiry into the actual state of things would shew that not only are these receptacles in the dwellings of the humbler classes *far too scanty*, but in a multitude of cases *wholly wanting*. It is in the hope of suggesting some alleviation of this evil that I beg to address these few remarks to the Institute.

As far as I know, there are but three kinds of cisterns in general use. *First*, there is the water butt; a rude and primitive contrivance, insufficient in capacity, and liable to speedy decay, and in its decay destructive to the quality of the water, causing it to teem with all manner of noisome creatures. *Secondly*, there is the *lead* cistern; a very costly receptacle when substantially constructed, and one which is liable to the serious objection of very frequently poisoning its contents. *Thirdly*, the slate cistern; a vast improvement upon its predecessors, and a contrivance with which we might well rest contented, were its costs such as would admit of its general adoption in the humbler classes of dwellings. The purpose of my communication is to suggest a *fourth* material, and to press upon manufacturers the expediency of their at once coping with and overcoming the practical difficulty of making *cisterns of a strong, coarse, earthenware, of ample size and at a very low price.* I will not suppose it to be beyond the reach of manufacturing skill to supply the great desideratum. I have seen and measured earthenware cylinders 2 ft. 5 in. in internal diameter, forming the lining in a well more than 2000 years old, amidst the ruins of ancient Selinuntum, and these cylinders were as sound and as serviceable as when first made.

Is it unreasonable to expect that the bakers of clay in the 19th century might improve a little upon the potters of Magna Græcia?

Surely we ought to excel the ancient Greeks in manufacturing skill, although we may have to succomb to them in æsthetics?

A vessel of this material 3 feet square and 4 feet deep would hold upwards of 220 gallons. What an immeasurable benefit would be conferred on the poorer classes if such a vessel could be supplied at a cost within the reach of their purses! Even if their means were too scanty to admit of their paying water rates, such a reservoir would be of signal service were it provided merely to receive rain, which comes down to us for nothing (except, indeed, our *thanks*, and even that is a debt not always paid). But I will not admit of the plea of poverty; for I doubt whether any one who cannot pay some moderate water rate ought to hold a house at all. Consider the cheapness of water. I have the best authority for saying that at least one great Water Company in London supplies a thousand gallons for sixpence. Therefore in a house containing ten persons, each of whom is supplied with ten gallons daily, the company's charge on that house would be $\frac{6}{10}$ of a penny, that is to say $\frac{6}{100}$ of a penny for each person for ten gallons. Whereas each of those persons would pay about thirty-four times as much for a single pint of poor, unwholesome, beer. In other words, bad beer is about 2700 times dearer than good water. I may add that in the event of any great extension of the supply of water, it does not seem unreasonable to anticipate a *still lower* rate of charging, at least to the poorest class of customers.

I hasten to close my remarks, but before doing so, I would venture to throw out, in the form of a query, another suggestion.

Why should not the supply of water to a house be made compulsory?

I do not see that it would be more unconstitutional, or arbitrary, to do so, than to make the supply of light and air to a house compulsory, which the Building Act does. So also the Legislature has not hesitated to make it compulsory on all builders to form drains. Ordinary paving and lighting rates are in fact compulsory charges on individual householders for the public good. It is true that, were such a course adopted, it would become necessary, in order to prevent Water Companies from abusing their privileges, to controul and limit, by enactment, their rates of charging; but no company would venture, I apprehend, to object to such a limitation, were every householder compelled to be a customer.

The quantity of water required to be supplied would probably be graduated according to the size and rent of the house, but I submit that to compel by special legislative enactment, a reasonable quantity of water to be provided in each house, would be a most salutary exercise of that power which a Government holds *only* for the public good. The larger a city becomes, and the greater the aggregation of its inhabitants, the more urgent becomes the duty of the Legislature (I say it with great deference) to provide, by stringent measures, and by a vigilant controul, for the health and well being of the people.

I am, dear Sir,
Very faithfully yours,
SYDNEY SMIRKE.

C. C. Nelson, Esq.
&c., &c., &c.

ON THE APPLICATION OF HYDRAULIC LIMES AND OTHER CEMENTITIOUS MATERIALS TO CONSTRUCTIVE PURPOSES.

By G. R. Burnell, C.E.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, Feb. 22nd, 1858.

In the very interesting paper lately read here by Mr. Boulnois, and in the course of the discussion which ensued upon it, some incidental remarks were made upon the use of concrete in foundations, which appear to merit more attention than they received at the time. Moreover the evidence which was lately given before a coroner's jury, upon the occasion of an enquiry rendered necessary by the fall of a chimney, displayed so strange an amount of ignorance of the real philosophy of the use of concrete on the part of a practical builder, who seems to have been of average ability,—an ignorance, it is to be feared, shared by far too many of our so-called practical men—that I have ventured to bring the subject before you again, with the hope of being able to induce you, and the members of the profession generally, to examine it anew. In other countries this has been done very carefully and very successfully. Perhaps, therefore, a brief record of the recent investigations and of the experience of Foreign and English Engineers and Architects may suggest both, what is still to be learnt, and what to be avoided, in the future researches to be made.

As it will be necessary in the following notice to allude to some controverted points of the chemical theory of limes and cements, perhaps I may be allowed briefly to state, even at the risk of going again over well trodden ground, the opinions which are now generally held upon that theory, before describing the works recently executed.

The objects for which limes and cements are used are, as you must be aware, firstly, to connect together the small materials used in building; or, in other words, to produce artificially monoliths of the size and shape required in any particular case; and secondly, to form preservative coatings upon the exposed surfaces of more perishable materials. It follows, therefore, that the qualities to be desired in a lime or cement are, that they should unite energetically with the bodies they are intended to join together; that they should set rapidly; and that they should attain within a very short period of time a sufficient degree of hardness to enable them to resist external causes of decay. In addition to these theoretical conditions must also be named the economical one; and it, therefore, should be considered that the previously cited advantages must be attained in conjunction with cheapness as to the first cost, and to the application of the materials. It is, in fact, this latter consideration of economy, which has determined the preference of architects and builders for the cementitious materials with a lime base; for otherwise it may admit of question whether bitumen, silica, iron, or other bases, might not yield cements of superior quality to those now generally employed.

At a very early period in the history of architecture the use of bitumenous and lime cements appears to have prevailed; though some of the boldest Pelasgic, and some of the most perfect Greek and Roman works were actually built without mortar of any kind. The Romans, however, used lime in most of their great works; and they were also well aware of the extraordinary property possessed by puzzuolano, of increasing the rapidity of setting, and the hardness of the lime, with which it was mixed. During the Empire and the middle ages, the art of mortar and concrete making, as practised by the Romans, was preserved; and indeed, although the use of concrete had been forgotten here, subsequently to the revival, it appears never to have been lost abroad. But even whilst thus practising upon a large scale the conversion of limestone into lime, with a view to the reconstitution of a solid homogeneous cement, the builders of former days paid little attention to the scientific principles involved in the operation. Smeaton indeed made some very shrewd guesses at the real facts of the case; and subsequently other chemists and engineers made advances towards the real scientific explanation of the phenomena attending the use of lime; but it was not until M. Vicat commenced his researches that any exact, or philosophical views upon the subject were propounded, or that attention was called to the real nature of the difficulties to be overcome before arriving at any satisfactory explanation of the problem to be solved in the attempt to arrive at a correct theory of the philosophy of limes and cements.

It would be out of place, here, to dwell upon the history of the various descriptions of limes and cements now used, further than may be necessary to explain incidentally the circumstances under which they were introduced; and those of my hearers who may be anxious to study this branch of the investigation, are therefore referred to Mr. Godwin's paper in the Transactions of the R. I. B. A.; to Genl. Pasley's work; to M. Vicat's numerous publications, or to the more recent and more scientific researches of M. M. Kuhlman, Fuchs, Signorilli, Uhagon, Minard, Chatoney, Rivot, &c. But it is important to observe that latterly somewhat different opinions to those which formerly prevailed, with respect to the circumstances under which limes and cements set, have been promulgated; and that the reasons upon which these new opinions are founded are sufficiently cogent to warrant a public examination of the methods of using those materials adopted especially in England, which would hardly have been prudent so long as the theory connected with them remained in its previous state. And as the practical questions involved in the consideration of the actual hardening of mortars are of vital importance to the architect, we ought carefully to examine the suggestions of competent observers, without yielding ourselves too implicitly to their, or to any other, authority. These suggestions may be most easily brought before your notice in a description of the works and the accidents which led to their being made.

Until within a very recent period, then, it was held that ordinary limestones when burnt in kilns parted with their water of crystallization and their carbonic acid, and were thus reduced to the state of an amorphous, spongy material, highly caustic, with a great avidity for water, and of small specific gravity. No change has yet taken place in this part of the theory of limes; nor have the principles enumerated by M. Vicat with respect to the influence of the various substances, in combination with the lime in the natural limestones, been materially shaken. The most competent authorities agree with M. Vicat in attributing the differences in the rapidity of setting of various ordinary limes to the presence, or the absence, of some of the different forms of silica, alumina, magnesia, or iron; or in some cases to a mixture of them all. The chemical combination of silica and alumina with lime in the stone appears to exercise the greatest influence upon the hardening of the resulting limes; or, in other words, the presence of the silicate of alumina in the limestone has been found to have so decided an influence upon the properties of the lime made from it, that the relative quantities of that salt ascertained to be in a stone have been universally admitted as forming a convenient scale for judging of its value as a source of lime. Perfectly pure carbonate of limestones, such as the upper and middle chalk, and most of the marbles, yield in fact a pure caustic lime, whose properties are that it swells when mixed with water sometimes to 2½ times its original volume, and that when in large masses it never hardens; within appreciable periods at least. The presence of a small portion of the silicate of lime in the limestone, (as in the case of the chalk marl) produces the following effects: firstly, that the caustic lime in slacking, or taking up water, does not swell to the same extent as pure caustic lime would do; secondly, that the resulting paste of lime, even when in large masses, will set within comparatively speaking short periods; and thirdly, that it resists the solvent action of running water more satisfactorily than pure caustic lime would do: the latter indeed would be entirely removed, if exposed to such a test for a sufficiently long period. A greater proportion of silicate of alumina increases the energy of the setting and hardening powers of the lime, as in the case of the blue lias limes; and finally, when the proportions of the silicate exceed a certain point, the limestones in which they exist yield a class of materials called "cements," which set without any marked increase of volume, and rapidly acquire a great degree of hardness, and are insoluble in water.

These various properties serve to classify the limes and cements; for the former are called *rich*, or *poor* according as they may, or may not, swell in slacking; and hydraulic, or non-hydraulic, as they may, or may not, resist the solvent action of water. The cements are all poor, and most of them are permanently hydraulic.

It is found that so long as the limestone does not contain more than 10 per cent. of foreign matters, the lime it yields is rich, and non-hydraulic. When the foreign matters exceed 10 per cent. the lime becomes more and more poor; but if the foreign matters should consist of the silicate of alumina, or the silicate of magnesia, the hydraulicity increases in proportion to them. The scale proposed by M. Vicat for the classification of these materials is based upon these principles, and it is briefly as follows.

The non-hydraulic, or rich, limes contain under 10 per cent. of foreign matters.

Hydraulic limes contain	clay	10	per cent.	lime	90	per cent.
„ „ „	„	20	„	„	80	„
„ „ „	„	30	„	„	70	„
The extreme, or limit, is	„	34	„	„	66	„
Cements contain from	„	40	„	„	60	„
„ „ to	„	60	„	„	40	„
Puzzuolanos contain from	„	70	„	„	30	„
„ „ to	„	90	„	„	10	„

The class of materials last named is a natural volcanic product, and the silicate of alumina it contains is able, when the several materials are properly manipulated, to enter into combination with rich limes, and to communicate to them the hardening and hydraulic properties they themselves do not possess.

Until very recently it was held by most engineers and architects, by myself amongst others, that the solidification of mortars took place in consequence of the absorption of carbonic acid gas by the lime, during the process of crystallization; but it has been fairly objected to this theory, that the quantity of carbonic acid gas contained in the atmosphere, which could be brought into contact with a large body of cement, would not suffice to saturate the latter. The generally received opinion on the subject now is, that limes harden, simply in consequence of the combination with water which takes place during the slacking, and that the rapidity of the setting and the permanence of the newly formed hydrate of lime depends upon its being combined with some other salt: the pure hydrate of lime in fact is soluble; the hydrated silicate of lime is tolerably insoluble, but it forms slowly; whilst the hydrated double silicate of lime and alumina, or of lime and magnesia, are practically insoluble. The facts actually observed seem to confirm these views, and they certainly enable us to account for not only the different modes of setting observable in different limes, but also for some of the more gradual actions which take place in that material, and the effects reciprocally produced by the mixtures of various ingredients. In the case of the now generally used Portland cements, and in that of under-burnt lime, some very curious phenomena may, however, be observed, which appear to indicate that the simple laws mentioned above do not comprehend all the conditions which may arise; so that the above theory itself must only be considered as a step towards the attainment of a complete one of a more general character. The phenomena to which I thus allude are connected with the obscure subject of the chemical actions which take place under the influence of high degrees of temperature, and we shall have occasion to refer to them in the sequel.

No sooner had M. Vicat published the researches and the experiments, on a large scale, which had led to the formation of his original theories, than a great change came over the practice of architects and engineers in the very important portion of the arts of construction connected with foundations. It was then seen that by using the proper description of lime for the particular position to be dealt with, it was easy to obtain solid, homogeneous bodies of any size which might be desired, by the use merely of small and irregularly shaped materials, and that it was also possible to make, artificially, solid channels or reservoirs which should allow water to flow through, or to be retained in them, without its communicating humidity to surrounding objects. Within a very few years from the promulgation of the discoveries of M. Vicat we accordingly find that the channel of the canal St. Martin was entirely formed of hydraulic lime concrete, in the parts where there was any danger from the infiltration of water into the cellars; the basins for the supply of water in the Rue Racine, and in some of the abattoirs, were also entirely constructed in the same material; and the French engineers universally adopted the system of backing the quay walls of their rivers, or the wing walls of lock chambers, with concrete. In erecting the suspension bridge of Souillac (which must have been executed before 1828, because Vicat mentions it in his "Resumé sur les Mortiers et Cements Calcaires," published that year, I think that it was built about 1824,) M. Vicat himself used an artificial hydraulic lime, composed of a mixture of clay and of the pure carbonate of lime, for the purpose of forming the concrete used in the foundations of the piers. This work is interesting on several accounts; not only on account of its furnishing one of the earliest instances of the use of artificial hydraulic lime, but also on account of the foundations having been formed in the style described in Mr. Boulnois' paper, now universally adopted by foreign engineers in their bridges, and which Mr. Page was so disgracefully attacked for introducing here. At Souillac, the system adopted was that of driving an enclosure of sheet piling round the intended positions of the piers, of dredging out the interior of the space thus enclosed, and then of filling in with hydraulic concrete through a depth of not less than 16 feet 6 inches of water. It succeeded admirably, although only ordinary hydraulic lime was used in the preparation of the concrete; the term *ordinary* being applied in this instance in contra-distinction to any of the cements.

Between the years 1820 and 1840, the French engineers paid much attention to the preparation of artificial puzzuolanos from brick earth, and many experiments on a large scale were made to ascertain the qualities of the materials so obtained. M. M. Raffineau de Lille, Julien, Bruyère, Raucourt, Treussart, Minard, &c. studied this subject at the same time with M. Vicat, and the result of their investigations was that they considered the lightly burnt clays (which in their normal state are merely hydro silicates of alumina) would produce the same effect in expediting the hardening of limes as the natural puzzuolanos (which are merely silicates of lime affected by volcanic heat) were known to do. There was nothing in this theory to justify any *à priori* doubts of its correctness, and consequently the artificial puzzuolanos were used largely in river works, and in works exposed to the action of sea water. For a time they resisted satisfactorily, but eventually I believe that all the artificial compounds of this description, immersed in sea water, have sooner or later fallen to pieces, and it is now universally admitted by engineers that sea water is able to destroy any mortars exposed to its action, which are composed of ordinary limes mixed with separately burnt clays, whatever may have been the degree of heat it has undergone. The mortars made by the mixture of limes with the natural puzzuolanos, on the contrary, have resisted this cause of decay, just as the natural quick setting cements, and the artificial Portland cement, when well made, have done; and the attempts to discover the explanation of the different actions of these various materials, under the same circumstances, have led to the actual state of our scientific knowledge on the subject of the most advisable manner of using them.

Amongst the most important works in which the avowed object of the engineers employed was to obtain, by the use of concrete, solid blocks of large volume, which should resist displacement by their mere weight, may be cited the Mole of Algiers, originally described by M. Poirel in a "Memoire sur les Travaux à la Mer," published in Paris in 1841. In this case it appears that the quay walls, and certain parts of the Mole of Algiers, were formed by pouring concrete into caissons sunk in the positions selected, and lined with tarred cloth. This system M. Poirel states that he borrowed from the practice of the Italian engineers, who, when they have to repair a breach in a sea wall, cast down bags filled with concrete; and he adds that when the latter system is adopted, it is found that the small quantity of mortar which exudes from the bags binds the latter together in a very decided manner. But in addition to this use of concrete, M. Poirel employed it for the purpose of forming the jetty in deep water, by means of solid artificial blocks, cubing about 360 feet each, and weighing about 22 tons. These blocks were made upon land, and allowed to set in the atmosphere, the concrete being made by means of pug mills, and rammed into wooden moulds. The French engineers, it is important to observe, are very particular in causing the lime which they use in concrete to be made up into mortar before it is brought into contact with the ballast; they look upon concrete, in fact, as neither more nor less than a rough species of rubble masonry, in which the proper composition of the mortar is the principal element of success—a principle sorely neglected by too many of our *practical* men. At Algiers, the concretes thus made were composed of two parts of broken stone to one part of mortar, which yielded, in place, two parts of concrete. But when the concrete was at once immersed in the cases, the mortar was composed of one part of rich lime, slacked and measured in the pasty state, to two parts of puzzuolano in fine powder; when it was used for the preparation of the artificial blocks, the mortar was composed of one part of lime, as before, to one of sand and one of puzzuolano. It was remarked that the puzzuolano which succeeded the best was the Roman puzzuolano, and that its action depended upon its being used in the state of a fine powder; in large grains, or in grains of the size of coarse sea sand, it was inert. The lime was obtained from the grey primary limestones of the district, in the works at first executed at Algiers; but of late years the Theil limestone, obtained from the subcretaceous series, has been substituted for the indigenous material. In placing the mortar in the cases, the concrete was let down in boxes, the bottoms of which opened on hinges; in filling the moulds of the air dried blocks, great pains were taken to ram the concrete into all the corners, and to consolidate it as much as possible before the setting commenced. These works have, I may add, succeeded remarkably well.

Another very novel and important application of concrete for constructive purposes was the formation of the new Graving Dock, No. 3, at Toulon, under the orders of M. Noel. In this case an enclosure of close piling on the sides and the land end, but open towards the harbour, was driven. It was about 400 ft. long by 100 ft. wide in the clear, and the ground within this enclosure was dredged out to a depth of about 45 ft. below the mean level of the sea. A solid bed of concrete was then inserted, *under water*, of the total thickness, on the average, of nearly 15 ft. between this enclosure, which had been previously lined, so as to prevent the washing away of the lime, by means of sail cloth paid with tar. After the whole surface of the excavation had thus been levelled to the required height, three large caissons, in eight compartments of the form it was intended to give the concrete hearting of the dock, were sunk in their definite positions and loaded with pig iron, &c. so as to compress the upper surface of concrete. Intervals of from 14 to 16 ft. wide were left between these great cases; and a space of 16 ft. 6 was left on each side between the sheet piling and the outer wall. The concrete of the side, head and gate walls, was then inserted under water as before; leaving, in fact, nothing but a lining of masonry and the steps, or altars of the Graving Dock itself, to be executed in ashlar masonry. The transverse spaces were filled-in with concrete, (which was afterwards removed) because it was feared that the infiltration would render necessary a great deal of pumping, and the engineer therefore thought it advisable to put in the bottom of the dock fractionally; but when a temporary earthen dam had been formed at the entrance, and the caissons were removed, it was found that the concrete had set so solidly that the anticipated danger from the infiltration proved to have been imaginary. Two small wells, indeed, (10 ft. long by 3 ft. 8 wide) suffice to receive the waters which come through the gates, those which fall as rain, or those which filter through the bottom. The quantity of concrete in the bottom was 554,336 cubic feet, and in the sides it was 418,612 cubic feet.

M. Noel has given a very able description of the work he thus so successfully executed, and of the mechanical contrivances he adopted, in the 28th vol. 2nd series of the Annales des Ponts and Chaussées for 1850; to which I must refer you for these all important practical details. It was indeed a marvellous work to insert a mass of concrete of these dimensions under so great a depth of sea-water; and its success must be attributed to the indomitable perseverance, and the ceaseless supervision of the engineer. M. Noel before commencing the immersion of the concrete, tried a series of experiments on the various limes and other materials at his disposal; and he finally resolved to employ in his concrete, a mixture of two parts of finely sifted Italian puzzuolano, and one part of rich lime measured in the slacked paste. These ingredients were mingled in pug mills; and subsequently mixed with broken stone, by being turned over with the shovel on a boarded floor, in the proportion of three parts of broken stone to two of mortar. M. Noel dwells a great deal on the precautions he adopted to get rid of the milk of lime which was forced out of the concrete when immersed; and perhaps the extent of this evil, as he describes it, may to some extent be explained by the great richness of the concrete he used. In the more recent works which M. Noel has executed, he has, I may observe, used the natural hydraulic limes of Theil, with very small proportions of puzzuolano; and indeed in many cases he has abandoned the use of this latter material entirely.

More recently even than the execution of this wonderful work, an equally successful application of concrete blocks in marine constructions has been made by M. Pascal, at the new port of Marseilles. In this case a large portion of the roads on the west of la Joliette, and the old harbour, has been enclosed, and a remarkably well planned set of basins and docks formed, by means of a large jetty, or enclosure wall, the hearting of which is formed of stones thrown down and allowed to assume a natural slope; but the top of the slope towards the sea, just at the foundation of the upright parapet and quay wall, is protected by means of huge blocks of concrete thrown down from above. These blocks are, each of them, about 353 cubic feet in volume, and weight about 22 tons, a volume and weight found to be sufficient to resist the disturbing action of the waves of the Mediterranean in this position. The composition of the blocks is as follows: the mortar is composed of three parts of the Theil lime, slacked by immersion, and measured in powder, to five parts of sand; or when it was necessary to obtain a more rapid setting, one-third of the sand was replaced by a similar quantity of puzzuolano: this mortar was subsequently mixed with broken stone, in the proportions of two parts of stone to one of mortar. The concrete was rammed into a mould, and allowed to harden in the open air for the space of three months before being immersed; when it was essential to immerse the concrete immediately, as in the case of the foundations of the quay walls, the proportion of mortar was altered to two of mortar to three of stone. M. Pascal informed me that the artificial blocks had hitherto successfully resisted all causes of decay, and he most distinctly expressed his preference for good hydraulic lime over any mixtures of puzzuolano, or over any natural or artificial cements, provided sufficient time were allowed for its hardening.

Amongst the most important observations which have been made on the use of limes and cements in the Atlantic ports, may be cited those made at Fort Boyard, by M. Garnier, and especially those contained in a report by M. Feburier, inserted in the Annales des Ponts et Chaussées for June 1852, (3rd series, 2nd year, 3rd number) and in which he relates the experiments made by himself at St. Malo, upon several descriptions of limes, puzzuolanos (natural and artificial) and trass. Some very sad failures have, indeed, occurred at St. Malo in the recent concrete, or other masonry works there executed, in consequence of the action of the sea water upon them; so that M. Feburier's Report had a strong adventitious interest at the date of its publication. The result he arrived at does not however appear to me to be perfectly correct, nor does he seem to have taken a sufficiently comprehensive view of the subject. The substance of the report, and the principles M. Feburier has since acted upon are, indeed; 1st, that mortars composed of rich lime and Dutch trass, do not resist the action of sea-water: 2nd, that ordinary artificial hydraulic limes, or the natural feebly hydraulic limes, even when mixed with feebly hydraulic puzzuolanos, equally do not resist: 3rd, that the only limes he distinctly states to be capable of resisting the said action of sea-water, are either the twice-burnt artificial hydraulic limes, or the natural hydraulic limes which approached the limits of the cements. M. Vicat has expressed a very unqualified approval of the principles thus enunciated; but really any person who has witnessed the extraordinary results obtained by the Dutch engineers in their hydraulic works, wherein they use almost exclusively mortars made of a mixture of the richest shell lime with trass and sand, must object to the absolute condemnation of such mixtures in the terms adopted by MM. Vicat and Feburier.

Towards the completion of the Breakwater at Cherbourg, some remarkable applications of cementitious materials were made under conditions which more nearly resembled those of ordinary English practice. The Breakwater itself is as you are no doubt aware, composed of a hearting of rubble-stone, à pierre perdue; upon the top of the mass a bed of concrete nearly 7 ft. thick, composed of hydraulic lime mortar and broken stone, was laid; the bottom being at the level of low-water of ordinary spring tides. Upon this bed, an upright wall of about 31 feet high towards the sea, and 30 feet wide at the platform level, was built of solid masonry, consisting of a course ashlar face of granite and large rubble hearting, set in hydraulic lime mortar when time could be allowed for its setting; or in cement (either Roman or Pouilly) when the masonry was likely to be covered rapidly by the tide. In many cases cement was mixed with the lime precisely in the manner of puzzuolano; and in the course of the work countless experiments were tried upon the values of all these materials. Latterly it was found to be advisable to protect the exposed base of the wall, seawards, by means of huge artificial blocks which should be able to resist, unmoved, the mighty waves of the Atlantic. These blocks were made just double the size of those used in the Mediterranean, or they were of about 720 cubic feet in volume, and weighed about 44 tons; yet one of them has been carried bodily a considerable distance. In building these blocks a mixed system was adopted: they were formed of rubble masonry, built up by hand on a platform on the risberme of the inner side of the breakwater, in a position wherein they were covered by each returning tide. The stone used was principally obtained from the schistous rock of the neighbourhood, and the mortar was either composed of Parker's or Medina cement and sand, or of Portland cement and sand, or of a mixture of Portland with one of the other cements. As a rule, M. Bonin, in his recent account of this gigantic undertaking, states that the engineers preferred the mixed cements; and that they only used the Parker's and Medina cements pure, when they required to guard against immediate immersion. The proportions adopted were $1\frac{1}{2}$ sand to 1 of cement (Parker's or Medina; or 2 sand to 1 cement Portland; or intermediate proportions when the mixed cements were used. M. Bonin observes that the Roman cements lose their power of rapid setting by being kept a long time in store, but that their ultimate resistance did not appear to be thereby affected; whilst, on the contrary, there was often danger in the use of Portland cement when it was too fresh. The engineers at Cherbourg appear to have given the preference to the built blocks of rubble masonry over concrete blocks, on the score of their obviating the necessity for wooden moulds; and the remarkable success of the system, notwithstanding the violent storms to which these blocks have been exposed since the first trials in 1846, has perfectly justified its adoption.

At Dovor and at Alderney, Portland cement has been employed on a larger scale even than at Cherbourg, and the artificial blocks made at those two harbours are actually used instead of large blocks of ashlar. The jetties in these cases are formed of granite facings, filled in with blocks of concrete at Dovor, or with very rudely built blocks of rubble masonry at Alderney. The concrete at Dovor is made by mixing about one proportion of Portland cement to ten proportions of dry shingle, in a box which is maintained in a perpetual state of eccentric revolution so long as the materials are in the interior; and then the concrete is forced into moulds, where it remains from eight to ten days, in order to set, thoroughly: the blocks thus made are slacked for two or three months at least before being placed under water by the aid of the diving bell. At Alderney the concrete is made usually of one part cement, 2 parts of sand, and four of shingle, and into this material irregular masses of rubble, constituting about 40 per cent. of the block, are inserted. This appears to be a very strange complication of the Dovor plan, and I confess that it is one I do not admire; because the use of moulds is compulsory in either case, and the insertion of the broken rubble by hand into the gangue of concrete cannot produce so homogeneous a mass as would be produced, if the concrete were made by one operation, and by the simultaneous mixture of the rubble itself, broken to the usual size of road metalling.

At Southampton Docks, and at Liverpool, the quay walls recently executed have been formed either by means of a rubble, or of a concrete backing, into the composition of which blue lias lime enters largely. Perhaps the Liverpool mortar-making machinery is the most perfect of any we have at work in our island, and the masonry executed with it is well worthy of examination. But, inasmuch as I have not been able to obtain particulars of it, I may be allowed merely to state that the various ingredients are mixed by edge runners revolving on fixed axles; but working in moveable troughs. The advantages of this system consists in the fact of its causing all the lime which may have passed through the screens after slacking to be equally hydrated, and at the same time; and thus it obviates both the irregularity in the setting, and the waste, which usually attends the use of blue lias lime.

In the execution of the Maidenhead Bridge, Mr. Brunel adopted a form and dimension of arch, which when the nature of the material employed is taken into account, must be considered to obtain its stability solely from the cohesion of the cement with which the bricks were set. The span of the arch was, in fact, 128 feet, and the radius of curvature at the crown was 169 feet; so that with ordinary bricks it was impossible that they should have at all acted as voussoirs. So closely indeed also did Mr. Brunel approach the actual limits of the resistance of the cement that the bridge was not completed without accident; and it must always be regarded as one of the hardiest even of his experiments. Latterly in France engineers have trusted even more openly, and avowedly, to the adhesion of cements and concretes; and after some small bridges of concrete had been built upon a mould, as a test of this new style of monolithic construction, M. Gariel proceeded to construct, in a somewhat similar manner, the arches of an aqueduct over the river Cousin (in the Yonne) of 103 feet span, 10 feet 4 rise, and 3 feet 3½ deep at the crown, and of the Pont aux Doubles, Paris, also of the span of 103 feet, rise of 10 feet 4, and with a depth of 4 feet 4 at the crown. These were executed in ordinary rubble masonry set in cement, and were built in sections upon the centres, leaving intervals at the springings and on each side of the key section, which were subsequently filled in and wedged closely together; subsequently the Pont d'Alma, at Paris, of 141 feet span, 28 feet 2½ rise, and 5 feet depth of crown, was executed in the same manner. The advantages of this application of cement are that they dispense with the necessity for the use of expensive ashlar voussoirs, and that they allow great economy in the construction of the centres. Moreover, as the vault can be commenced at several places at a time, the temporary load can be distributed more evenly than can possibly be the case with the voussoirs, working up regularly from the springing; thus not only is there an economy of time, but also the deformation of the centres is avoided. Advantage might be taken of the peculiar properties of the rapid setting cements to execute other forms of structures, such as domes, groined vaulting, &c. with considerable economy over the ordinary systems.

But perhaps the most interesting observations yet made on the class of materials under notice are those recorded by MM. Chatoney and Rivot in the Annales des Mines for 1856, in an article upon building materials used in sea water, of which I have published a translation in the Journal of Gas Lighting, &c. MM. Chatoney and Rivot do not indeed recommend any new processes, nor do they introduce any new materials; but they elucidate many obscure points in the philosophy of limes and cements which have hitherto escaped notice. Thus, for instance, they enunciate distinctly the principle that the formation of an artificial silicate of lime must be a slow process when effected in the humid way; and therefore it is that the system of allowing the various materials time to digest, as it were, a system which formerly prevailed here, and still prevails in Holland, is very correct. Mixtures of lime, trass, or puzzuolano, in fact require to be worked over frequently before being employed, care of course being taken to complete those operations before the crystallization begins. MM. Chatoney and Rivot with equal justice attributed the resistance of mortars to the action of sea water, to their compactness; and what is more doubtful, to the fact of their containing a proper proportion of free lime at the time of their application, which should form a coating of carbonate of lime able to protect the hydro-silicate of lime during its formation. I say this latter proposition is doubtful, because the experiments of Professor Way go to prove that the hardening of limes depends solely upon the manner in which the crystallization consequent upon the hydration takes place, and the eminent French engineers whom I have cited certainly have omitted to examine the effects of the excessive burning to which Portland cement is exposed, or the startling changes produced in plaster by a second calcination after having been slacked in saturated solutions of alum and borax. The degree of calcination affects this question to a far greater extent, I believe, than our French guides—for they are our guides in these matters—have yet admitted; and whilst I beg to be allowed to express my admiration for MM. Chatoney and Rivot's labours, I cannot but consider that much still remains to be solved in the mysterious theory of limes and cements.

I cannot conclude this very imperfect sketch of the recent applications of the class of materials under consideration, without recording as formal a protest as I can, against the ordinary mode of making concrete in this country. The system usually is to pour lime (in a ground state) out of a sack, upon a heap of ballast, without measuring either lime or ballast. The lime is slacked immediately upon the ballast, and turned over until the Irish labourers, who usually are charged with this work, are satisfied with its appearance. It is then put into a barrow, and shot into its place from a height. Anything more absurd than the whole of this system could not, I believe, be imagined. There is no security for the perfect hydration of the lime, none for its equal and intimate mixture, none for the compactness or solidity of the mass. Without dwelling upon the abstruse chemical questions involved in the scientific part of the theory of limes and cements, I believe that I am justified in saying that good concrete can only be made by carefully slacking the lime as the first operation; by carefully mixing it with sand in proper proportions, so as to make a good mortar; by mixing this mortar with sharp angular ballast; and finally, by compressing the whole mass of the concrete so made by means of a careful ramming. We hear still of practical men, as they are called, and of professional men who ought to know better, attaching importance to the use of lime "hot," as they call it. Of course no one who knows anything of the real philosophy of the subject would listen to such nonsense; but the prejudice in its favour is still so strong, and I have lately encountered it in so many unexpected quarters, that I feel bound to remind the worthy partisans of the opinion I thus impugn, that the mere fact of the lime's being "hot" proves that it has not completed the whole of the process of hydration, and that, therefore, there is always a danger of a subsequent disturbance of the materials with which it is thus mixed. I believe that the mortars for concrete ought to be made with the same care as the mortars of the best brick work; for concrete is, indeed, but a rubble masonry of small materials. It would, I am also convinced, be preferable to make this mortar under edge rollers, and to mix it with the ballast in pug mills; and certain I am that the carelessness, if not the ignorance, of our practical builders in the use of limes, is one of the principal reasons for the excessive use of cements we witness in England, in positions wherein lime properly used would answer every reasonable purpose. It was principally with the hope of reviving interest in the enquiry into the right use of these materials, both limes and cements, that I have felt it desirable to bring before you the above brief notice of some of the proceedings and researches of our neighbours.

Mr. Ashpitel, Fellow, said, with regard to the asserted hydration of lime, and the re-absorption of carbonic acid from the atmosphere forming another carbonate of calcium, that if such were the case, it would be necessary, in order to prove it, to experiment by synthesis as well as by analysis. In other words, if, when lime had been burnt, and then slacked or hydrated, it became carbonate of lime, they ought to be able to reverse the process so as to make it become chalk instead of mortar; and in fact to be able to burn it again and once more to make lime of it. This however could not be done, or only imperfectly. It was therefore clear to him that the whole theory of the chemistry of lime was not thoroughly understood. The reason the Romans had retained the art of making their splendid mortar was because they really could not do otherwise. The travertine and peperino they used were not limestones, their only limestone being the marble from the Appenines. They had no sand, the only substance like it being the natural puzzuolano, by the traditional use of which they made their extraordinary mortar, which indeed rendered their structures almost monolithic masses. It had been stated that this puzzuolano resisted the action of sea-water, which the artificial puzzuolano would not. The Mediæval architects in their concrete or rubble work, did not appear to have employed hydraulic lime. They took ordinary chalk and burnt it as well as they could, but the result was admirable. It was evident that they used it in a very fluid state; a fact shown in the large winding staircases at Rochester Castle. Structurally these were composed of nothing but concrete, and that it was used in a fluid state was shewn by the manner in which it had passed between the crevices of the waling boards and through every knot hole; the solid mass, when set, carrying the stone stairs. The latter were in fact only added to give a better foothold. He had made numerous enquiries, but nothing like hydraulic lime appeared to have been used in the middle ages. Sir C. Wren had given great attention to hydraulic limes used on land, but Smeaton was the first to give any serious notice to those used in water work. Scientific men had now arrived at this point:—they could make artificially hydraulic lime; as Portland cement, a most admirable material. Many years ago his father and himself had tried experiments with common clay and chalk, and found they could make very good hydraulic cements; but however successfully these resisted the action of fresh water, subsequent experience shewed they would not resist sea water, and for this there must of course be some reason. It had not escaped the observation of Mr. Burnell, that the compositions usually called concrete in this country were much too hastily got up. They should rather be put together in the way called by their French neighbours "*béton*," and should have time to become thoroughly hydrated. But there was another fact; with fat or rich limes and trass the English architects did not succeed in making that sort of hydraulic composition which the Dutch made in former times, and (as Mr. Burnell stated) at present. There must, therefore, be a *tertium quid*, or something which in this country was not understood. That was manipulation—an important thing, for the fatter the lime the more time it should have to become hydrated. Returning to the theory of hydraulic lime and its resistance to sea water, he had often thought it probable that puzzuolano possessed one condition wanting in the substances generally mixed to make hydraulic limes, because puzzuolano contained much oxide of iron. He had learned, with much surprise, from Messrs. Grissell, who had been building some very large bridges in Essex, that on taking up the concrete of some structures which had been removed, they perceived that the most durable portions, which had best resisted the action of sea water, had portions of iron in contact with them, and that they had consequently adopted the plan of throwing scrap iron into their concrete, and in one instance a piece of hoop iron; and the result was that their concrete became, he might say, *iron bound.* Masses of shingle were frequently found on the chalky sea coast with an appearance of red rust, hanging together so firmly that neither hammer nor pickaxe could separate them. Now the peculiar colour showed that there was a great deal of iron in them; the same was the case in puzzuolano. He had not tried Messrs. Grissell's plan himself, but if his information was correct, and if the theory he founded upon it was right, it afforded a very short and simple method of improving the manufacture of concrete for marine constructions. He could not conclude without expressing his deep regret that his friend the late Commendatore Canina had been prevented, by his untimely death, from carrying out the experiments he had intended to make on all kinds of hydraulic limes, and to compare them with specimens from the remains of Ostia and the aqueducts at Rome. Messrs. White had sent specimens of Portland and other cements to Rome, for the purpose of these experiments, but they remained still unpacked, and nothing was likely to be done. Had Canina's life been spared, he (Mr. Ashpitel) might have been able to lay the results before the Institute.

Mr. Burnell begged to explain that he did not mean to imply that manipulation constituted the sole difference between the Dutch and the English concrete. The effect of puzzuolano and trass depended upon the action of the silicate of alumina which they contained upon the lime. This action was very slow when it took place in the humid way, and it was therefore necessary that the lime should be turned over frequently, thus rendering a large amount of labour requisite. The high price of labour in England made it almost impossible to afford so much manipulation in turning over the lime and concrete as was used by foreigners, and no doubt that was one reason why we were driven to the use of the quick setting cements. With regard to the presence of oxide of iron, it was no doubt a very valuable material for hardening concrete, but it was an exceedingly expensive one. He understood that iron filings had been mixed with the concrete for the Victoria Tower, and no doubt it had answered; but a proper proportion of Portland cement concrete would have produced a better result for less money; and, after all, these things were questions of money.

The Chairman, Mr. J. J. **Scoles**, V.P. said, that Portland cement was not known when the foundations were laid for the Victoria tower.

Mr. **Burnell** observed that at all events blue lias lime was known, and, if properly used, it would have made a concrete quite equal to that actually used.

The **Chairman** said that blue lias lime was not used in London, or was not in the market at the time referred to.

Mr. **Burnell** said it had been recommended by Smeaton many years before.

Mr. **Woodthorpe**, Fellow, proposed a vote of thanks to Mr. Burnell. The meeting would all agree with that gentleman in his remarks on the inferiority of concrete as generally used. The rage for cheapness, and the modern system of "cutting," would not enable the architect to spare a sufficient quantity of labour on the foundations of his structure. Mr. Burnell's paper would enable them to store up some valuable information, and they might impress upon employers that a little more money ought to be spent under the earth than at present.

Mr. **Kerr**, Fellow, seconded the motion. Mr. Burnell had not alluded to that species of hydraulic lime which was formed by the mixture of blue lias lime and "smiths' ashes," a metallic sand; the mixture being one of the hardest that was known. Smiths' ashes would have produced the same result as iron filings in the concrete for the Victoria tower. Although they might not understand the chemical theory of limes, they ought to understand the mechanical question of mortar; but this unfortunately was not always properly considered. They all acknowledged the theoretical point that the smaller the quantity of good lime, and the larger the quantity of sand, the better would be the mortar; the reason being that the strength of the mortar did not lie in the lime, but in the sand; the smallest quantity of lime acting as a cementitious material between the grains of the sand being theoretically the perfection of mortar. What Mr. Burnell had said was therefore very true and important, as a large quantity of lime intervening between masses of stone in badly mixed concrete formed a very different cement indeed to good mortar. The interstices of the stone should, in the first place, be filled with sand, and then the particles of sand filled with the lime.

Mr. **Ashpitel** referred to the roof of the Pantheon at Rome, mentioned by Mr. Burnell. This he believed was not entirely of concrete, but was formed of ribs of brickwork, with arches at the top and bottom, between which the concrete was filled in. It had stood remarkably well. The dome had been originally covered with tiles of bronze, which however had been taken off.

Mr. T. H. **Lewis**, Fellow, said that the skeleton of the dome was formed of ribs, in the manner of an iron dome, and the spaces between the ribs and the arches were filled in with rubble work or concrete.

Mr. C. **Fowler**, Associate, stated that he had seen the concrete put in for the foundations of the Victoria Tower, and to the best of his recollection smiths' ashes, and not iron filings, was the material employed to add to its solidity. The concrete was prepared with a degree of care which he had never before witnessed, and as a young student at the time, he had been very much struck with it. In reply to the Chairman, Mr. Fowler added that the lime and sand were not mixed as mortar before being combined with the ballast. Indeed he had never seen or heard of that plan being adopted in England.

The **Chairman** said that the late Mr. Savage, in his advice and specifications, always recommended the mixture of the lime and sand before the pebbles were added. Notwithstanding however the somewhat slovenly plan generally adopted, our concrete appeared to set in a short time, and stood very well.

Mr. **Burnell** observed that it would do so when confined within the earth, and that lime in the very worst concrete would slack and form a solid mass in damp ground; but the great test was exposure to constantly changing sea-water.

The **Chairman** referred to the sea wall at Brighton, which was exposed to the action of the waves.

Mr. **Burnell** said that in that case, he believed the lime and sand had been mixed first, and the shingle added afterwards. The great difficulty arose in such works as that at Toulon, where a thickness of 15 feet of concrete had to be thrown through a depth of 45 feet of water. Minion, or the scales from roasted iron ore, had been recommended by Smeaton for mixing with blue lias lime; and these scales were much the same as smiths' ashes. The Belgian engineers employed the ashes falling through the grates of the lime kilns, which carried down with them a portion of the coal and the lime, and made a very good hydraulic cement for earth work.

The **Chairman** referred to a sea wall on the coast of Norfolk below low water mark and exposed to the waves, in which a very good hydraulic cement had been made from Dorking lime mixed with the sand of the beach.

Mr. **Burnell** said that Dorking lime was made from the lowest beds of the chalk, which were highly charged with soluble silica, and amongst which Professor Way had found some of the most remarkable of the beds on which he had been experimenting. He was therefore quite prepared to hear that, if those beds were properly selected, one of the most magnificent hydraulic cements which it was possible to use might be obtained; indeed he might say that it was in this source they ought to seek for a natural puzzuolano.

Mr. **G. F. White**, Visitor, believed that smiths' ashes would only form a mechanical mixture with the lime, whereas a small quantity of iron (from 2 to 3 per cent.) was found in chemical combination with all natural cement stones. The difference was analagous to that which existed in the manufacture of cement by steeping the sulphate of lime in a mixture of alum or borax, which produced a different effect to that which would be obtained by mixing it with the sand or the cement while it was being guaged. He doubted very much whether the hardness of cement was aided by, or whether any value was to be attributed to, the presence of iron beyond a certain point. He believed the combination of the alumina with the lime in certain proportions, and their proper combination to the degree of baking, were of great importance. After all the great point was the way in which the cements were manipulated. At Dover the concrete was formerly made by hand, and with all the "elbow grease" that could be given to it the result was a very imperfect combination. By the present plan a drum placed at an angle of 45° was made to revolve on its own axis, and by a concentric motion the contents of the top of the drum were constantly cast to the bottom of it. The mixture thus produced was perfect. He was himself concerned with the manufacture of the material and not with its use; but he must compliment the English architects and engineers on their economical use of materials as compared with the French. At Dover the blocks of concrete which had been described were produced at a cost of 7*d.* or 8*d.* per foot cube, all expences included; whereas at Cherbourg, where he did not think they had a more solid combination, or more salt water or wave resisting power than at Dover, the expence incurred by the way the materials were combined was 16*d.* per foot. In fact the cement alone cost the same as the labour, cement, and other materials and expences at Dover. He thought this an important feature to be borne in mind.

Mr. **Newton**, Associate, referred to a large block of natural concrete which he had seen at Dover some years ago, and to the desirability of carefully considering the conditions under which these blocks were formed on the chalk cliffs washed by the sea, and how far exposure to the sun and the lapse of time affected their solidity.

Mr. **I'Anson**, Fellow, referred to a case in which wood ashes had been mixed with lime and used in concrete in the same way as smiths' ashes. It was the pavement of a forecourt which had been subject to continual wear and exposure to the weather for many years.

Mr. **Burnell** believed that this tended to bear out his remarks on the effect of soda or common salt, which were in some respects analagous to wood ashes or potash. Some effect, which could not be at present explained, was undoubtedly produced by these materials in the hydration of lime. He should be very unwilling however to subject such concrete to exposure to sea water.

Mr. M. D. **Wyatt**, Hon. Sec., proposed a vote of thanks to Mr. Sidney Smirke for his communication on the subject of Water Supply. He wished that some gentleman practically acquainted with the pottery trade had been present to favour the meeting with information respecting Mr. Smirke's suggestion. He thought they must feel, when they considered the vast improvement which had of late years been made in drain pipes, and other articles of large size, that sufficient progress had been made to render it easy to carry out Mr. Smirke's suggestion, unless practical men could point out any difficulty. It would certainly be desirable to get rid of the article "cisterns" in the plumber's bill.

The **Chairman** said that wooden cisterns lined with zinc were very good; they were cheaper than lead, and less liable to be stolen, whilst they did not injure the quality of the water.

Mr. **I'Anson** said he had seen cylindrical zinc cisterns of large size without wooden cases, and also large cisterns of wrought iron galvanized. The latter were lighter than either slate or lead. He feared that cisterns of pottery would be liable to fracture if exposed to frost.

Mr. **Ashpitel** said he had visited Staffordshire in reference to the fittings for some baths and wash-houses, and found on enquiry that the ordinary bath was about the limit of the potter's art in point of size, and even these were necessarily high in price, as they broke two out of three in the making. Cisterns of earthenware would be too heavy, and very subject to injury from change of temperature, as baths were often fractured by the sudden admission of hot water. He was afraid the suggestion of Mr. S. Smirke could not be practically carried out. The cheapest thing of the kind was a number of large drain pipes built up one upon the other, but these were also open to the same objection.

Mr. **Burnell** said that the real question was, the best plan of supplying a certain quantity of water cheaply to the poor, and he was disposed to believe that the most sensible system was that of the constant supply, so as to do away with cisterns altogether. It was, however, important in that case to prevent waste of water, which was carried on now to such an extent as would prevent any Corporation or Water Company supplying it so cheaply as it should be supplied. He felt convinced that it would ultimately be necessary to let the supply pass through meters, and sell it by measure.

Mr. **Ashpitel** seconded the vote of thanks to Mr. Smirke, which was carried unanimously, and the meeting adjourned.

REMARKS ON BYZANTINE CHURCHES.

By the Rev. J. L. Petit, M.A. Hon. Member.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, March 8th, 1858.

I am quite aware that the subject of Byzantine architecture, on which I am going to read you a paper, is one about which the majority of my audience probably know more than myself. For till last year, I had seen nothing Byzantine, except, as one may say by reflection; and at the present time I have seen no more than such specimens as came in my way during a somewhat hasty trip to Athens and Constantinople. Still I shall address you with confidence, as the fresh impressions of a traveller, however imperfect or incorrect, are often suggestive; and I am sure that any of my remarks which may be calculated to mislead, will be speedily corrected; and should anything I say be thought worthy of discussion, I shall gain much more information than I fear I am likely to give. Without raising the question as to what buildings are properly to be called Byzantine, and what Romanesque, if there be any marked distinction of style between them, I will begin by remarking that it is not now my intention to notice any that are altogether borrowed from Roman work; as churches of the basilican form, or those which may be classed under the head of circular churches, such as S. Costanza near Rome, S. Vitalis at Ravenna, and Little S. Sophia in Constantinople. Their introduction at present would take time, and confuse the subject.

I look upon the Byzantine style as peculiarly interesting; for it appears to have been the first really original development of Christian architecture, and to have held its ground, with little essential change, through a very long period, over a large tract of country; it has moreover furnished types to which we are indebted for some of the finest buildings in existence. The arch and the dome, we know, were both used by the Romans. But the pendentive which connects them, itself as refined an invention as either, did not make its appearance, as far as I am able to learn, till it was applied by the Byzantine architects to their domical structures. I mean that kind of pendentive which is formed by the section of a larger dome than that which it sustains. The vertical support of the arch on which it rests, or the wall to which it is attached, and certain abutments by which its lateral pressures are counteracted, not only preserve it in equilibrium, but enable it to bear the weight placed upon it, just as a dome open at the top, is made to bear a lantern. I observe that Mr. Fergusson, in his chapter on Sassanian architecture, gives a building of very early date in which a dome is supported by arches. But in this example the Romanesque pendentive is used; an arch, or series of receding arches, being thrown across each angle of the square; a construction better adapted to a polygonal, than a cylindrical or hemispherical superstructure. If this was the universal mode of construction employed by the Sassanians, it does not invalidate the claim of the Byzantines to their own peculiar pendentive, however it might have led them towards its invention.

I have spoken of certain abutments as necessary to counteract lateral pressure. Such as are required in the vertical plane of the arch itself are supplied by its own masonry or that resting on it. But there are clearly other pressures which act at right angles to this plane, and have a tendency to push the arch outwards. It must be a most difficult problem to calculate these mathematically, even on the simplest basis; perhaps it can only be done by experiment. In small buildings, I suppose, they need not be taken into account; the weight or thickness of the wall, or the cohesion of the materials will be found sufficient; but in domes of a considerable span some sort of abutment must be necessary at every point of the arch in a direction at right angles to its plane. This is best furnished by a barrel vault, or else the semidomical roof of an apse. On this account, I conceive the Byzantine style is not calculated to develop itself in the direction of Gothic, the essence of whose construction is the concentration of pressure upon single points, and the separate independence of each bay of vaulting, above the spring of the arches; the avoidance in fact of any action upon a principal arch, in any direction except in its own plane. I merely advert to this point, the full consideration of which would occupy a great deal of time. We may observe that the Byzantine pendentive is used only at rare intervals on our own side of the Alps, except in districts where an eastern influence was clearly at work, as in Aquitaine; nor does it seem to be of frequent occurrence in Italy. Even at Palermo the two buildings which exhibit the most decidedly Greek character, namely the Eremitani and the Martorana, have the Romanesque pendentive; the Byzantine, however, is used in S. Costanza, in the island of Capri, in the Bay of Naples.

The baths of Diocletian, have in fact, a more direct tendency towards Gothic, than any of the Byzantine churches in the East, or those in the West which are derived from them (as the cathedrals of Perigueux and Angouleme), notwithstanding their adoption of the pointed arch. But though not Gothic in its principle, the Byzantine construction is perfectly scientific and artistical; and accordingly we find that it was gladly accepted by the revivers of the Italian style, and continued to prevail in the East, when the Greek church was superseded by the Saracenic mosque. We know, from Procopius, that S. Sophia, in all essential points, was originally what it is now; that it had its central dome supported by four arches. Nor do I suppose it has ever been doubted that the present pendentives are either the original ones themselves, or, at least, of the same form and description. Now it is not at all likely that a novel construction of such delicacy was attempted for the first time on so enormous a scale. It is far more probable that Justinian and his architects found the same mode of building to be in common use, perhaps in the very churches which they pulled down and replaced with others of greater magnificence. I do not know whether there are churches of the sort whose date is ascertained to be earlier than the time of Justinian, that is, the sixth century; but I should think it possible that such exist in many parts of the East. If the small number of Greek churches with which I am acquainted at all fairly represents their general character, I am inclined to look at S. Sophia in many respects as an exceptional building rather than a typical one. We will consider its plan, simplified by clearing it of the aisles and galleries which lie beyond its principal area; its horizontal section in short taken through the springs of its main arches. I have made use of the plan in Mr. Fergusson's hand-book, as that gives me the section I want more clearly than any other that I know of. This plan both shows the general construction, and expresses the leading lines on which the internal effect depends. It consists of a square compartment, having to the east and west semicircular apses of its full width. From the eastern apse branch out three smaller ones separated from each other only by the necessary piers, and with them occupying the whole of the semicircle. From the western apse branch out in like manner, two others, with a passage between them leading to the outer parts of the building. The north and south sides have no transepts or projections (you will remember I am speaking of the upper part of the building), but present flat walls, pierced with windows, and arches supported by columns. Now, unless I am mistaken, the radiating apses, which we have noticed, are by no means common in Greek churches. I will not say they never occur; Lenoir's plan of the Church of the Apostles, in Athens, give something of the sort. I am sorry I did not see its interior, but I dare say I shall be excused for not giving my undivided attention to Byzantine churches while I was in Athens. In most cases the Byzantine apses seem to be parallel. We are well acquainted with the radiated apse as belonging to a large district in the south of France, Auvergne being its head quarters. Occasional instances of it occur beyond this district, and even in England, but rarely on the Italian side of the Alps. And if we take a tract of country comprising Italy, Greece, and much of the East, I suspect we may fairly pronounce this arrangement of the apses of S. Sophia to be somewhat abnormal. And the want of transepts is unquestionably so. According to mathematical strictness, as we have observed, the construction requires transepts; and I have very little doubt their want was felt in this instance. The depth of the huge buttresses to the north and south tells us that transept walls were wanted, and their immoderate thickness gives us a hint that the abutment which should have been supplied by a roof was missed in no small degree. In the neighbouring church of S. Irene, destroyed by fire in the reign of Justinian, rebuilt by him, and afterwards much repaired in consequence of injuries from an earthquake in the eighth century, the transepts are perfectly well developed, although, as in most Greek churches, their fronts, in the lower part of the building, do not project beyond its outermost wall. I conceive we must attribute the peculiarities of the plan of S. Sophia to a certain timidity on the part of the architects, who were frightened at the boldness of their own design. And this timidity, as is generally the case, led them into danger. It is probable that no arches then existed of a span equal to that which they were contemplating; a span scarcely differing from the diameter of the dome, that is, upwards of 100 feet. I am not aware that any other such arches now exist; their springs you will observe are at a height of near 80 feet from the surface of the ground. Of course I do not speak of bridges, which have a solid abutment of rock. The arches in Diocletian's baths, and in the Temple of Peace, do not, if I recollect, exceed 80 feet. And those under the dome of S. Peter's are not more than 90 feet, though the diameter of the dome itself is considerably greater than that of S. Sophia. Now we may well imagine that Anthemius and Isidorus, when they came to put their ideas into brick and stone, felt that they would rather have only two such arches to deal with, instead of four; and their first expedient would be to turn two of them into blank arches, and fill them up with walls, which might save them from the necessity of providing any extraordinary abutments to the east and west. Still they had to provide abutments to the north and south, and must have done so to good purpose, for according to the story handed down to us, these buttresses were strong enough to bear a great and sudden thrust. I do not know to what stage of the work the anecdote I allude to refers; most probably to the completion of the arches themselves, before the pendentives and dome were added. You will correct me if I give a wrong version of the story.* The architects ran in a great fright to the Emperor, and told him that the great eastern arch, then resting on its centreing, was swaying about in a most alarming manner, threatening to destroy its supports, and throw the whole fabric into ruins. The Emperor, it was supposed under some divine inspiration, for he did not pretend to any mechanical skill, ordered them immediately to knock away the props from under the arch, telling them it would settle down of itself to its proper shape, and then remain quiet. The operation was performed with success. Soon afterwards the two arches which were supported by actual masonry began to play the same tricks, and cracked the walls and columns below in every direction. The architects again ran to their employer, who prescribed the very same remedy; ordering them to knock away the stone centreing, the wall which filled up the arch, wherever it came in contact with its inner surface; and not to fill up the void, till the arch had thoroughly settled. Consequently the abutments provided by the plan of the building to the east and west, though it was at first intended they should have no pressure at all to sustain, proved in fact, amply sufficient for the thrust of the entire arch.

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* Since the above account was read by me at the Ordinary General Meeting I find that in retailing Procopius's anecdote about the arches of S. Sophia, I had misunderstood both the Greek of the original, and the Latin translation. The true version of the story is this. That while the eastern arch was yet incomplete at its crown, the weight of what was already finished, at each end, appeared to be too much for the temporary supports, which began to crack in every direction, and threaten instant ruin. Justinian's advice was not, as I supposed, to take away the supports, but to complete the arch, for, said he, it will then sustain itself without the aid of the framework beneath. As I admit the error, there is no occasion for me to explain how I fell into it; but I would remark that the version I gave of the story seems to involve no absurdity, if the sequel of it, respecting the other arches, is to be relied upon. The arches to the north and south were raised upon walls, which acted the part of centreing, and, like the actual centreing of the eastern arch, showed symptoms of being distressed by the weight above. In this case, the arches seem to have been complete, but they had not been allowed to settle, and therefore the emperor ordered the architects to remove those parts of the masonry beneath, which came in contact with the arches, and not replace them till the mass above had settled, and become perfectly dry and solid. The first fright of the architects arose from the effects of an unfinished arch, the second, from those of an unsettled arch. The apparent danger was pretty much the same in both cases, but the causes, and consequently the modes of cure, were different. The passage is quoted in Verneilh's "Architecture Byzantine en France." J. L. Petit.

With regard to the radiating apse, I imagine it to have been suggested by the demand for a buttress in the direction of a transept. Its wall, you see, forms a kind of diagonal buttress, which a small addition of solid work might render sufficient for its purpose. But whatever may have been the motive of the architects, these radiating apses give additional extent, both in reality and appearance to the area, and much beauty and variety to the views of the interior. I do not know another building in which the impression of great uninterrupted space is so marvellously conveyed. And if we take a utilitarian point of view, the plan is certainly worth consideration in the present day. Had the central part, now covered with a dome, been vaulted instead, no blame could have been thrown on the constructive design, though undoubtedly the effect would have been far less imposing. In that case the whole lateral thrust of the roof would have been concentrated at the four angles of the square, which are the points of support. In the present case, a great part of the thrust is so concentrated, but not all. Some, as we have remarked, must have acted upon the arches during their whole length, and though in small buildings the amount of this portion of the thrust is immaterial; in one of so large an extent it could not but have been felt, and perhaps was the cause of some disasters subsequent to the first erection of the building.

The usual types of Greek churches combine great strength with elegance. I have remarked three principal ones. The first I can best explain from a plan and sketches of a small church near a monastery at the foot of Mount Pentelicus.

If we take away the narthex, or western porch, and a small eastern apse, the plan is externally almost square, and internally cruciform. The arms of the cross are very short, being little more than deep arches or recesses. At their intersection is a dome or lantern, the inside of which is circular in its plan, but the outside octagonal. At the angles of the square are solid masses of masonry, which form the abutments of the arches. These only occupy the lower part of the building; the cruciform composition developing itself above, in the external as well as the internal view, an arrangement generally adopted in Greek churches. The later mosques frequently carry up the square unbroken, the dome rising from within. In the example before us, the apse is internally semicircular, externally angular, the diagonal sides springing directly from the eastern wall. This is also a common Byzantine feature. To the same type I should refer those churches in which the piers of the principal arches are heavy and solid masses of masonry, even if they do not fill up the area between the elegant inner cruciform plan and the outer square plan, but allow passages or aisles. In this case the transept becomes longer, and the principal eastern apse is often flanked by two smaller ones. As this type of Byzantine church is the simplest, I am inclined to look upon it as the oldest, though churches of a later date may be found belonging to it; for instance, the elegant church of S. Theodore in Athens, which, I believe, is assigned to the end of the twelfth or beginning of the thirteenth century. S. Irene, in Constantinople, of which we have already spoken, may be referred to this type; from which, also, are derived the domical churches of Aquitaine.

The next, in point of simplicity, probably also of date, is the one to which I specially wish to direct your attention. In this, the square area at each angle of the plan (still externally square), and which we have hitherto seen filled up with solid masonry, or else shut out by a large and massive pier from the rest of the church, is thrown open to it, having only at the angle which corresponds with the springs of the principal arches, a comparatively slender column, connected with the adjacent walls by arches of smaller height and span. The main arches do not spring from the capitals of these columns, but from a point on a higher level than the crowns of the small arches, which may be considered as forming, together with their column, a kind of square open pier, attached to the walls, on the top of which pier rest the barrel vaults connected with the central dome. The spring of the vaults is occasionally marked by a string or cornice, but not always. Sometimes all the angles are treated in this manner; sometimes only those to the westward, the eastern ones retaining the solid pier. Of this latter description is a church in Corfu, to which I had time to give some attention. Its dedication, I understood, was to SS. Jason and Sopater, who were supposed to have built it, or a church on the same spot—we will therefore call it S. Jason. It struck me as having a remarkably good outline, from whatever point I viewed it; and the inside, though very plain, and a little bit modernised, was not without considerable dignity. The plan and sketches will show you its general character. The columns belonging to the western piers of the dome are of marble, and probably antique. Their diameter, near the base, is about 1 ft. 10 in., and the height of the shaft 10 ft. 2 in. The distance between them is about 15 ft. Their capitals are rather clumsy, being spread out into a wide abacus, on account of the mass they have to sustain; but, in some examples, this part of the design is treated with great elegance. The narthex is in three divisions; the central one nearly of the same height as the nave, and separated from it by a screen of three arches on two slender marble columns. This compartment has a barrel roof running in the same direction with that of the nave; the lateral compartments are lower, and have barrel vaults which run north and south. All the arches are round. The dome (as usual) has a drum, internally round, externally octagonal; its square base shows itself above the outer roof; this also is usual. The pendentives are of the Byzantine form, and on them are sculptured extremely rude symbols of the Evangelists; whether these are marks of antiquity, or freaks of the modernising Venetian, I cannot tell. The apses are all semicircular in the inside, but the outside of the principal one is angular. In my plan I have drawn lines showing the direction of the axis in each of the barrel vaults; from which you will perceive that the outer wall receives an extra thickness where it is required to act as an abutment. And I may also notice that the marble columns do not perhaps really bear the full weight they appear to bear; for, as the masonry settles down, a sort of arch or buttress may be considered as being virtually formed, passing through the crown of the principal arch to the outer wall, or some other strong mass of masonry, and sustaining much of the superincumbent weight. If the form of these churches were adopted as a model, such relieving arches might be built in the walls, as they doubtless often are under similar circumstances.

Had I been able to decypher certain Greek inscriptions on marble slabs, I might possibly have found some clue to the date of this church, as well of another little church situated upon Ποντικονησι, which signifies Mouse Island. In this latter, the most decidedly Byzantine bit, the east window is, to say the least, equivocal; and yet I hardly think it can have been the work of the Venetians. The span of the arches under the dome is about six feet and a half, so you may suppose it is not a very large edifice. I have attempted to give a general view of it, as well as a trellis of vines which hid nearly the whole, would allow. The island is one of those seen from the one-gun battery, a spot visited for the sake of the view, by every one who touches at Corfu.

Of the Byzantine churches in Athens given by Couchaud, some have disappeared, and been replaced by larger structures. Among these is S. Taxiarchus. Such as remain, have been enough restored to make us hope that their preservation is intended. The old Cathedral will, I trust, be allowed to rest in security under the protection of the new one. This latter, by the way, is a building of which the modern Athenians will have no reason to be ashamed, though its general proportions might have been better. It recognises the Byzantine style, but by no means copies it slavishly. I wish the photograph I bought had taken in the doors, which I admired very much; the windows are far inferior in design. But to return to the old Cathedral. The dome rests, in the manner I have already shown, on four very slender piers, which, I suspect, have been substituted for antique columns. The principal apse alone appears externally, those on each side of it being sunk in the thickness of the wall. The walls are faced externally, if not built, with blocks of sculptured marble, and the doorways display a classical elegance. This little building has been supposed to be of very high antiquity. But I was told by a gentleman residing in Athens, that he had heard its claims disputed; and I must say it appears to me, on strong grounds. For while some of the sculpture on the outside is classical, (you will observe especially a frieze or range of small figures under the cornice), a great deal of it is decidedly Byzantine, and as decidedly not *in situ*. The attention to symmetry and regularity is just what would be shown by a person who had to deal with a number of promiscuous specimens that happened to come to his hand. Much more regularity of pattern would have been obtained by an architect or sculptor designing a front in new material. There is no want of symmetry in Byzantine architecture; on the contrary, it is rather carefully observed; nor was it likely to be neglected in the arrangement of sculpture, when designed with a view to the spot it was to occupy. By symmetry, I mean a harmonious correspondence, not an exact repetition of pattern. The use of old classical materials does not make against the antiquity of the specimen in question, but the use of Byzantine materials does very decidedly.

The church of S. Saviour, situated at the foot of the rock of the Acropolis, and partly cut out of it, has four marble columns, of classical proportions, and apparantly antique, in the positions already indicated. The church is very small, and has no narthex; but, besides the picturesqueness of its position, I was much struck with the beauty of its outline. It is figured in Lenoir's work. According to Couchaud's plan, the church Των Ασωματων (of bodiless spirits or angels) near the Temple of Theseus, has also the four columns. I did not go into it, as it seemed much modernised.

Another church of the same dedication, near the hill of Λυκοβηττις, has also four marble columns. The narthex has a dome over its central compartment, which appears externally in the form of a second octagonal lantern, smaller than the principal one. A modern western porch has a dome which does not appear on the outside. This repetition of the principal dome in another part of the building seems to have been common at an early period. We notice it in S. Irene, Constantinople; and Procopius mentions one of Justinian's churches, which, in the number and position of its domes, must have been something like that magnificent example of a later period, S. Mark's at Venice.

The church of Kapnicaréa has, if I recollect, four columns of classical proportions. To the north of the central dome is one of less elevation, the arches of which rest on solid piers. The narthex presents, on its western front, a series of four gables, and is entered through a very elegant porch on the south side. M. Couchaud spoke of this church as likely to be pulled down to make way for a street. But as his work bears the date 1842, I trust the danger has passed away. A sort of square is being formed, of which this beautiful object will occupy the centre. The Greeks seem now to prize their monuments, and are disposed to preserve them where it is possible.

The church of S. John the Divine, near the Acropolis, has two columns; the eastern arch resting on piers connected with the east end. The masonry of these churches consists mostly of squared blocks of stone, their courses being separated by thin bricks or tiles, which also occur in the vertical Joints. The arches are generally turned with brick, and the strings are enriched with bricks projecting diagonally, and forming a serrated edge, just as in brick-work of the present day. You will probably have noticed the peculiar composition of most of these Athenian domes. The drum is externally octagonal, each face being finished at the top in a semicircular arch, resting on the rough shafts and capitals which occupy the angles, Within this arch is the window, sometimes a double one; and above is the dome, covered with tiles. Now, whether you admire or condemn this kind of finish, you cannot pronounce it altogether fanciful. For, supposing a hemispherical dome to stand on a cylindrical drum, if you change the latter into an octagonal one by cutting it with vertical planes, the above form will be the result; and the faces will show the position of arches, which, when pierced through to the cylindrical and spherical inner surface, need present no double curvature. I visited a small ruined monastery upon Mount Hymettus, which has a church on the same type, having four columns. But I mention this especially, to show that the construction cannot be of a weak or perishable nature; for although the monastic buildings are altogether in ruins, the church, of which the outer roofs present the appearance of heaps of loose tiles and rubbish, is yet in perfect preservation; and, what makes it the more remarkable, the columns, though very slender, are not monolithic (as they are in almost every instance), but composed of several pieces. I have no doubt very little of the weight of the dome actually presses on them.

The third Byzantine type, probably the latest of the three, is that which we find at Daphni, a few miles from Athens, on the road to Eleusis. I was very glad to find it there, for otherwise I must have sketched S. Nicodemus, which is almost wholly rebuilt, and though I believe very correct, is terribly unpicturesque. However, I picked up a photograph of it. I have been obliged to resort to Couchaud's work to help me out in my plan of Daphni, as I took my notes very hastily, and did not see the side chapels. The characteristic part of the arrangement is, that each side of the square circumscribing the dome has three arches instead of one, the central being the largest, consequently the dome occupies a portion of the building analogous to that covered by the dome of S. Paul's, or the lantern of Ely; namely, a space equal in width to the nave and both its aisles. Across the angles of this square are thrown arches with conchs. And, observe, they are provided with a truer abutment than most Romanesque pendentives in the western churches; for as their spring is placed over a pier, they have the advantage of whatever may be on the other side of the pier; whether a continued wall, or an arch. The octagon, supported by these conchs, is connected with the circular drum and dome by small pendentives. The drum externally has sixteen sides; at each angle is an engaged shaft of small projection. The diameter of the dome is not more than 24 feet; yet the whole building, which is beautifully situated, has rather an imposing aspect. Towards the west end is some work of a Gothic period. This type is partly followed, in a columnar form, in the church of S. Fosca at Torcello, near Venice. The tower of S. Antonio, at Piacenza, of which a section is given by Mr. Fergusson, is supported according to the same mode of arrangement; as is also Bramante's dome of S. Maria delle Grazie (in the cinque cento style) at Milan. And the plan is suggestive of that of S. Stephen, Walbrook, the outside of which is perfectly Byzantine in its composition.

It is not quite so easy to study Byzantine churches in Constantinople as in Athens. In the first place, they are mostly changed into mosques, and are not readily opened to the profane. In the next place.

their Christian names do not seem to be very well known. I had seen in Mr. Fergusson's book, that one of the best specimens was the Theotocos; so I asked my guide (a Greek) if he knew it. "Oh yes," said he, and took me to a miserable little mosque, with no appearance whatever of antiquity, though he assured me there was some old Byzantine work inside. However, I told him this would not do, and he must try again. So, the next morning, he took me to a real Theotocos, still used as a Greek church; but though it was old, with a central lantern, it was not the one I wanted. The dedication is, I dare say, as common as S. Mary's with us. I persevered in insisting that he should find out my particular one, and shewed him the print of it. At last, about a week after I had put him upon the search, he found it out for me; and, by a judicious application of baksheesh, got me into a garden where I could take a sketch of it, and also enabled me to see the interior. This has four slender octagonal columns under the central dome; but the principal feature is the outer narthex, which presents a succession of domes. I was told its name as a mosque was Ecclesia Zamisi. (I see Gailhabaud and Lenoir give its name Θεοτοκος του Λιβου.) The triple groups of churches are a remarkable feature in the Byzantine architecture of Constantinople. That which is figured by Lenoir as the Παντοκρατωρ, was shown me as the Μονη της Κορας. I did not see the interior. The largest of the three churches, at least that with the loftiest dome, stands on the north side. I was told that the mosque, which comprises the whole group, is called Stavros Zamisi. If this is taken from the original dedication, one of the churches must have answered to our S. Cross. Lenoir's Μονη της Κορας, if I am right in identifying it, for my sketch does not quite coincide with his cut, is a triple church with the largest dome in the centre. There is some good mosaic work left in one of the smaller domes. The name of the mosque, I was told, is Cachrea Zamisi.

Another triple church, of which I have never seen any print or description, was shown me as S. Demetrius. This also has its largest dome in the centre. But the southern church is the richest, and has the columnar arrangement under its dome, though one only of the columns is left standing free; one being built up into a wall, and two cut away for the purpose of throwing the several buildings into one. This, by the way, proves what I have said as to the smallness of the weight actually dependant for support on the columns. The eastern dome is Turkish, and I suppose altogether modern. The name of the mosque is Fetia Zamisi. As I know nothing of the language, I cannot answer for the correctness either of my spelling or pronunciation. I give the names in the best way I can, to help you in finding the things. The external lantern, in most of these examples, is either round, as in S. Irene, or of a polygonal form more nearly approaching to the circle than the octagon. Many of them have engaged columns at the angles, and arched faces, in which, however, the segmental arch prevails. The ends or fronts of the buildings show the cylindrical form of the vaults.

And now to wind up with a few practical inferences. Will the buildings we have noticed furnish us with any available hints? There is much beauty, picturesqueness, and elegance in their outline; their proportions are often remarkably pleasing; and they are treated with a breadth and simplicity from which we might well take a lesson. I have not observed in them any miniature reproductions of constructive features; such as useless blank arcades or panelling. A full scope is given for very delicate and refined workmanship; but where this is not to be had, the commonest brickwork is made to counteract any baldness or meagreness of effect. A good and useful internal area is secured, with little or no loss of space; the construction is sound and durable, and the materials of the whole building, roof included, are, or may be, perfectly imperishable and indestructible. The architects of the revival by no means neglected these examples. During the autumn before last I had the pleasure of passing a few days in Venice at the same time with a distinguished member of your Institute, Mr. Penrose, who I think will bear me out in my admiration of the beautiful little church of S. Chrysostomo, which we visited together. It is a regular Greek church Italianised, with central dome, Byzantine pendentives, and cylindrical roofs. Its four piers, situated as in the examples we have noticed, are of a proportion even more slender than that of classical columns, in fact the whole framework of the edifice is so slight, that it has been thought necessary to connect the springs of the arches with iron ties. It must belong to the earliest period of the revival. We have the plan of the Greek church with four columns, in S. Martin's, on Ludgate Hill, and in All Saints, Northampton; but in the former the central space is vaulted, instead of domed; and in both the columns are connected with the walls by entablatures instead of arches.

If the little church of S. Saviour, in Athens, were transferred bodily into one of our cemeteries, it strikes me that a more beautiful chapel could not be devised to occupy such a position. But we may go further than this. Let us suppose a plan nearly similar in size and arrangement to S. Jason in Corfu, only cutting off what would be to us superfluous excrescences, and substituting columns for the eastern piers. We might, I suppose, safely give a span of about 20 feet to the dome and principal arches, and about 10 to those between the columns and walls. The whole area would be upwards of 40 feet square, broken only by four columns, which need not exceed two feet in diameter. This would make a roomy and convenient church, subject to very little clerical eclipse. Its proportions, if carried out according to our Byzantine examples, would be rather lofty. The nature of the construction suggests the manner of treatment. In the first place, solidity and thickness of outer wall, whatever be its material, is indispensable. In the next place, the columns themselves I would have monolithic if possible; of the firmest and hardest marble that can be procured, or, still better, of granite, porphyry, or serpentine; in any case, a material not liable to split, peel, nor suffer injury from vertical pressure. The beauty of the whole building will depend much on that of the columns. If a classical order be adopted, the Corinthian, or even Ionic, is to be preferred to the Tuscan or Doric, because in these latter the angles of the abacus are without support from beneath, while they bear much of the weight above. I need not stop to explain why this objection applies in the case of the arch, but not in the case of the entablature. If the Corinthian order be employed, the capital should be spread out, as at Spalatro, to receive the spring of the arches. As the masses above the columns would not admit of the addition of superfluous matter, on account of weight, nor of much subtraction, on account of strength, and the construction demands that the rib of the arch should have little or no projection beyond the surface of the barrel vault, we must not count upon deep architectural mouldings, or sunk or raised ornament, among our means of decoration; and are consequently thrown upon the same resource with the Byzantine architects, namely, the employment of colour, an art which cannot better be studied than in their works. However there are several positions in which cornices, strings, and horizontal bands of carved work may be introduced with propriety, and be so managed as to secure the general effect from an appearance of poverty, even should the use of painted glass render mural painting inadmissible. I will not say it would be impossible to Gothicise a church designed on this plan, but it does not naturally suggest a Gothic mode of treatment, even should the pointed arch be used in preference to the round one. The plan would be found very tractable in revived Italian, nor does it seem to require the introduction of any features which have been pronounced unmeaning or inconsistent. And without avowedly imitating Byzantine ornament, we might borrow from that much which is really excellent. The treatment of the outside would afford scope to the genius and taste of the architect. Though I rather admire the Athenian dome, I would not recommend its adoption; it might savour too much of mimicry. The more ordinary forms admit of much variety of design. The fronts, in their simplest form, present a gable which is flanked by wings finishing at the top in a horizontal line. Here are two Renaissance buildings which suggest different modes of dealing with this form. One gives a predominance to the horizontal line, the other to the vertical. Perhaps the latter is the best, as the projection of the central compartment gives abutment where it is most wanted. The west front of the old cathedral of Athens (given in the photograph) is a good and not unclassical composition, and the transept of the Ασωματων furnishes an available suggestion. But the accomplished architect will know instinctively what to reject as mannerisms, and what to secure, as having an essential value, independent of style and fashion.

I have sometimes been accused of coming home from a tour with my head full of the last thing I have seen, and recommending its imitation in preference to anything else. I assure you this is not my case at present. I do not like the Byzantine style because I have seen a few examples of it, but I went to see those examples, because I liked what I had previously learnt of the Byzantine style. The objects themselves were new to me, but their types had long been familiar to my imagination, and I welcomed them rather as old friends, than as fresh acquaintances.

As the revivers of Gothic architecture disclaim the imputation of mere copyism, and profess their aim to be development, I can only wish them every possible success. But I am unable to get rid of the impression, which grows stronger upon me the more I study the subject, that Gothic is the style of an age very different from our own, and cannot easily be transplanted into the present century. No doubt, whatever really good national style we may strike out, must have a great deal in common with Gothic; for so grand, beautiful, and powerful an emanation of human genius cannot have passed away without leaving deep and lasting traces behind. But of those striking and characteristic features, by which the style is identified, and which constitute its charm to its admirers, the greater part, I fear, will be found to have been impressed upon it by an age and tone of society long gone by, and will gradually fade away on its development to meet the views and exigencies of the present. Whereas the classic styles, and those more immediately derived from them, whatever faults or incongruities they may exhibit, however they may have been debased from time to time by incompetence or misconception, show that they are grounded on forms and principles of beauty which neither age nor fashion can affect.

Mr. Beresford Hope, Hon. Fellow, moved a vote of thanks to Mr. Petit for his admirable paper on Byzantine architecture. Every one, whatever his particular views as to the best style for the architecture of the future, could have but one feeling, and that of gratitude to those who, like Mr. Petit, consistently, laboriously, and enthusiastically, endeavour to impress on others their own opinions. But notwithstanding the great interest which Mr. Petit took in his studies, and his anxiety to carry out as the style, in the future of architecture, which should as admirably represent the age of the swallow-tailed coat and chimney-pot hat, as the classic might have represented the flowing robes of Rome, or the picturesque dresses, or rather no dresses at all, of Grecian statuary—he hoped, whatever style might be ultimately adopted, it would be one in conformity with the common sense and good taste of the age; and perhaps that might not be the one displayed by the drawings on the walls. Whether or not the Gothic might be the style, it was not for him to determine, but there was no doubt that, for the last fifteen years, there had been a strange consent on the part of almost all English architects to adopt that style for ecclesiastical purposes. If he might hazard a conjecture as to when the revival of that style began, he would attribute it to the publication in 1842 of "Brandon's Illustrations of Parish Churches," a book to which the school of modern architecture was more indebted than to any other issued either before or after it. The buildings shown this evening were, if not very small, still not large enough to hold such congregations as (he would not say our great cathedrals) our first class parish churches were capable of accommodating. They were evidently built to meet the exigencies of a particular climate, and the requirements of a religion in which mere ceremonial wthout any teaching seemed to have been the animating spirit. He did not think that buildings of that kind could be absolutely and unchangeably adopted for our model. Nor could he persuade himself that derived as those buildings might be from classical types, having mouldings and details which, though neither exactly Grecian nor Roman, yet had a pedigree to be traced up to those styles, with arches of that rounded form which Rome developed, and by which she altered the Grecian style, and which from Rome was again imported into Greece—he could not persuade himself that the details of those buildings could lay claim to that purity of style, exact proportions, and simplicity of detail which characterised the Athenian Parthenon and the Erectheum. Fond as he was of the Gothic, he could yet have a great admiration for the Byzantine school—an admiration, however, founded on its classical pedigree. We either must confine ourselves exclusively to one school, or become the advocates of those mixed and derivative styles, which have flown from the one great fountain of classical architecture. He believed, however, the admiration for these mixed styles to be founded on mere personal predilection, and not to be capable of philosophical demonstration.

Mr. M. Digby Wyatt, Hon. Sec., said,—However different the roads by which men endeavoured to ascend the hill of science and of art, still they had one common object in view. He believed the explanation of the great differences that had arisen between the partisans of various styles of architecture was, that they were anxious to convert that which they most admired themselves into a type for universal adoption. Now it was quite possible to appreciate in the highest degree the beauties of any particular style, to feel most intensely the charm of its historical reminiscences, and to endeavour to retain every practical part of the symmetrical proportions on which it was based, and yet not to desire to see that style carried out to the exclusion of every other. It was very commonly said in the present day, that the future English ecclesiastical style must be a sort of olla podrida. A singular concatenation of circumstances tended to produce this peculiarity. By means of engravings, hung up in nearly every house in the inhabited world, and of photographs, we had the opportunity of studying all that had been done in different times. But it would be most unwise and prejudicial if, because we admired and recognised the beauties of strictly classical architecture, we shut our eyes to the elegant plans and picturesque forms of other styles; and because we admire these Byzantine remains and beautiful colours, to neglect the Gothic. Each of the various styles of architecture was to be admired in proportion to its intrinsic excellence. He believed, the real solution of the difficulty might be found by taking our natural taste and wants as the base of operation, and that it was possible to arrive at a perfectly original style, suited to the purposes for which a building was required; and which, although it might remind us occasionally of some particular style, should yet be almost, if not perfectly, original, simple, and beautiful.

With reference to the suggestion of Mr. Petit as to the use of brick in ecclesiastical buildings, he must confess that in towns he did not like to see a Gothic church rising out of a mass of brick buildings. It might be very beautiful in itself, but he should prefer to see such a church in a more rural situation. He thought the churches described this evening well adapted for towns, because rising from among our ordinary town brick buildings, they might be made to harmonize with them. He believed they could be erected very economically, and that for religious services they offered advantages considerably greater than those constructed on a Gothic plan. Adopting the Gothic style with limited means prevented justice being done to that style; and want of funds would often compel them to have thin walls, unsatisfactory columns, and slight timbers. It might be said that the mouldings were quite correct, and all the work perfectly according to authority, but still he contended that was not the proper way of carrying out a design, and he did hope that if we could not afford to work in Gothic well, we should be content with a more humble style of architecture.

Mr. Ashpitel, Fellow, would call attention to the extraordinary story alluded to by Mr. Petit, that when the Emperor Justinian was told that the arch would not stand with the centre in it, he ordered the centre to be knocked away, and that then the arch did stand. The subject had been noticed by a French gentleman in a letter to Mr. Birch of the British Museum, stating that the asserted suggestion of Justinian was entirely a piece of flattery of Procopius, and that so far from its being true, the fact was that the building, as originally constructed, was a complete failure, and that the whole design had to be altered. This gentleman had not made a note of the author from whom he had extracted the passage, but thought it was to be found in "The Anecdota," a later work of Procopius, in which, however, he (Mr. Ashpitel) could find no such passage. Several of his friends thought they remembered the passage, but as the Byzantine historians filled some some forty folio volumes, he was afraid the search for it would be tedious. There had always been a tradition that the Byzantine forms were derived in some way or other from the Persian and Arabian. In some of the Byzantine specimens, there was a dome with four domes, one on each side of the large dome. Then there was a not very different form of dome at St. Mark's at Venice, and at Padua, one large dome in the centre with four smaller domes around it. Now this was very much the form of the buildings in Egypt and Persia—he would ask Mr. Petit whether there was anything in these Asiatic buildings resembling the pure Byzantine?

Mr. Petit said that he knew nothing of those buildings except what he had seen in Mr. Fergusson's work. He did not see in them that particular form of pendentive—the Byzantine pendentive—but the Roman pendentive was used.

Mr. Charles Barry, Fellow, said he had felt some difficulty in comprehending the reason of the very common introduction of tie bars across the openings of arches in Italian churches. According to one account they were almost always found in churches in countries subject to earthquakes, and where the foundation was not of a stable character. But they had been used in places where earthquakes were never known to occur. He believed therefore that some of those structures had such severe thrusts and counter-thrusts to endure that they could not exist in any country without such aids. Mr. Petit mentioned only one Byzantine example in which he had seen an iron tie bar. If that were an exception to the rule it showed that the Byzantine style was good in point of stability. The difficulties which Mr. Digby Wyatt had mentioned as arising from limited means would be experienced in building in every style as well as in the Gothic, and the architect would be driven to economise by some means or other. He had been induced to think the great argument in favour of Gothic churches, and one reason for their almost universal adoption during the last twenty years was, that Gothic was more plastic and susceptible of expansion than any other style. He could not help thinking decidedly that the same amount spent on a strictly Gothic church would produce a far greater effect than if expended on one built in any other style. It was often said that we must not attempt a particular style unless it was to be carried out perfectly. Now it was very well known that it would require as large or larger an amount of funds to carry out the Byzantine as the Gothic.

Mr. Petit said he never observed any Byzantine buildings where iron ties were necessary, except in a little Byzantine building in Venice, the church of St. Crisostomo; but he did not believe there was a single tower in Venice that was quite perpendicular, and many were very much out of the upright. He did not, however, remember in any of these Byzantine buildings which he had seen that there was any necessity for iron ties. The columns were of very hard, good material, and, no doubt, perfectly capable of bearing a very great weight, and generally the arches were so constructed as not to throw so much thrust into the internal area, as some other kinds of arch did.

Mr. Penrose, Fellow, said that the church alluded to, as well as almost all in Venice, had iron ties, which were very common in Italian buildings, and there universal. The church of St. Crisostomo was a good illustration of the capabilities of this style; and he remembered Mr. Petit remarking on the spot the very great fitness of the building for the worship of the Church of England. As to these iron ties, he would observe that the Italian architects in one or two instances seemed to have protested against them. In all the works of Brunelleschi they were excluded, his consummate mathematical skill having led him to discard them. With respect to the admirable concluding hints of Mr. Petit's paper, he was induced to think that when fashion, or practice, or other causes had driven English architects into the Gothic channel, it was impossible for an individual architect, or even a body of them, to set themselves against it. It was to be regretted that the earlier Christian types had not been more tried in this country. The church recently built at Wilton, as an instance, afforded him the greatest pleasure, and he wished that the Romanesque and Byzantine styles had been more frequently adopted, though he must own that he admired the Gothic almost, if not quite, as much as any of its advocates present.

Mr. Jennings, Fellow, said that architects building churches had almost always too small a sum at their command. When there was sufficient money he should be very glad to see the classic style adopted, and he believed the reason why it was not introduced was its great excess in cost over the Gothic. There could be very little doubt from the drawings on the walls, that the construction of Byzantine churches would be more expensive than Gothic ones of the same magnitude. With regard to the specimen church shown by Mr. Petit, which he supposed would accommodate only about 300 persons, he thought the construction not well adapted to the requirements of the English service.

Mr. Petit said he was not giving these churches as exact models for construction, but as ideas for development. He drew that specimen church for the sake of showing how the original type might be modified. There was no necessity for a perfect square on plan, but it might be lengthened transversely, or else in the direction of the central passage. Moreover he had not given it as a model for cheap church architecture, as a dome was required, and consequently lofty proportions, all which were unfavourable to cheapness.

Mr. Digby Wyatt, Hon. Sec., in reply to the observations on the comparative cost of construction of the different styles, said, the minimum of what was wanted in a church was the simplest arrangement possible; a series of arches, columns, doors and windows, and, if the internal area was very wide, besides the side windows the middle of the church must be lighted from the top. A roof was essential, executed in as presentable a form as might be. But when an architect was restricted to a totally inadequate cost, he was reduced to adopt the strictest economy, and all he could do was to take care that the doors were well shaped, that the columns had good shafts, capitals, and bases, and that the windows, whether round or flat headed, were well proportioned. If that was done it satisfied the eye, and required only the plainest and most natural working out to express, and accord with the object of the building. But as soon as he affected the details of any historical styles which could only be properly carried out by neglecting strict economy, he challenged a comparison of his work with buildings of a more costly character, which must tend to the disadvantage of the cheaper structure, and show that the architect had not accomplished his intentions, but had produced something neither Gothic, Byzantine, nor Classic, something, in fact, that aped to be what it was not.

Mr. Beresford Hope said, if we were to adopt as the basis of future operations what had been thrown out this evening, he hoped they would not fall back upon tradition, but would look only to what was practicable, and suitable to our race and climate. With this view he thought the Byzantine not the style to be adopted, as it was quite evident that, without a departure from the designs displayed, it could not be adapted to the requirements of the present age. Rightly, or wrongly, architects had agreed that for Englishmen of the 19th century, the style of the 15th, the 14th, or even the 13th, was as likely, perhaps more likely, to approximate to their requirements than the style adapted to the hero worship of the Greeks of the 4th century before our era, or even the style of the Romans of the 4th century after. The climate was still the same, the language was substantially the same, and the Christian religion, whether before or after the Reformation, was at least more nearly related to the Christianity of any age than the paganism of either Greece or Rome. So that, unless architects were at once, without any example at all, to start for themselves and ex-cogitate a new style, if they wished to ensure legitimate and moderate results to meet the wants of the age, they were far more likely to succeed by, and would have something like an intelligible starting point in taking up the style which had satisfied our grandfathers and great-grandfathers in the days when they had the same Parliament, the same laws, the same Royal race upon the throne, the same Magna Charta to fall back upon, and the same good old language to speak as ourselves. If a very cheap church were wanted, where was there a cheaper style than that in which the pillars might be merely circular, with only one or two mouldings, and the arches merely fulfilled their structural purposes? It remained to be seen whether the Byzantine would be tolerable if carried out in that very plain form. In this old English style, the types which were to be seen in the villages of Surrey and Sussex, that was perfectly legitimate, although it might be wanting in the higher attributes. Under these circumstances, again repeating their acknowledgments to Mr. Petit for his excellent lecture, he trusted they would all go away unconvinced, and not throw to the winds their practice and their teachings of many past years, and build churches which, although they looked well in Athens, would be totally inappropriate in London.

Mr. Thos. Hill, Visitor, thought the Byzantine style more simple than the Gothic. It had been said that iron tie rods were common in Italy, and some reference was made to earthquakes rendering them necessary, but earthquakes had not happened at Westminster, and yet in the Abbey there were very strong iron ties. He imagined that the Italian architects had used them for the same purposes as our ancestors at Westminster.

Mr. Pocock, Fellow, said, it was not only in Italy that iron ties were used; there were strong ones at St. Pauls as well as Westminster Abbey, and many churches would be much better with them. The extensive adoption of the Gothic style for churches during the last fifteen or twenty years he believed was to be attributed to its being a distinctive style for buildings devoted to public worship. In the country it had prevailed for a long time, and when the number of churches in London had been increased, the Gothic style had been more extensively adopted than perhaps was consistent with good taste. He would confess to disliking to see in crowded parts of London a church which would be very suitable in the country.

Mr. Chas. Barry, referring to iron ties, said, the question was, not whether they should be considered improper where applicable, but whether any tie should be inserted across the opening of an arch, which arch proceeds on the assumption of disdaining such assistance. That was the fallacy particularly exemplified in the Italian buildings, in all of which they had been built in the original structure; but his impression was that the ties in English buildings generally were after additions rendered necessary by the over ingenuity of architects presuming too much on their powers of construction.

The Chairman, Mr. Scoles, V. P., said, that after a church had been neglected perhaps for centuries, and the pinnacles knocked off, of course there was a want of weight and pressure to keep the piers in their places, which necessitated the introduction of tyes. In Italian buildings he could never make up his mind whether they were built in originally or were put in afterwards.

The votes of thanks having been passed, the Meeting adjourned.

DESCRIPTIVE PARTICULARS OF THE REMAINS OF KILCONNEL ABBEY, IRELAND.

By James Blake, Architect.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, March 22, 1858.

Among the numerous tourists and archæologists who run round the country every year, there are but few who know that the West of Ireland, the county of Galway in particular, abounds with remains of the most important character, as exemplars of Ireland's only perfect style of Mediæval church building, and of its peculiarity as compared with the contemporary styles in England. From among these remains I have chosen the present for illustration, in consequence of their comparatively good state of preservation, and of their being perhaps the most peculiar in mass and detail.

Kilconnel, a village to which the Abbey gives its name, lies about ten miles distant in a westerly direction from Ballinasloe, thirty from Tuam, and twenty from Loughrea. The country for very many miles round is comparatively flat; the tower consequently constitutes a very important feature in the landscape from numerous points of view. Like that of most of its class, the history of Kilconnel is scanty, being almost limited to local traditions. The name is derived from two Gaelic words, *Kil*, a burial place, also cell, and *Chonaile*, or Connell, the name of the person who founded the Abbey in the territory of Minitch and Hyamen, and was a contemporary of St. Patrick. His establishment, however, soon came to an end; and in 1400, William O'Kelly erected a house here for Franciscans. On his death, in 1420, his son Malachy undertook a more extensive scheme and completed the whole about the year 1460, to which period I consider that most of the present remains belong. It is recorded, that the supposition of James the First being favourable to the Roman Catholic cause occasioned most of the religious houses, not in too ruinous a state, to be repaired and re-occupied by monks or friars. Among them, up to the year 1604, we find the names of Multifernham, in Westmeath; Kilconnel, in Galway; Rossariel, in Mayo; Buttevant Kilkrea, and Timoleague, in Cork; Quin, in Clare; Garrinlough, in Desmona; with others in the cities of Waterford and Kilkenny. I find, however, no traces of repairs characteristic of this period at Kilconnel, and I am led to suppose that the works were confined to re-roofing some portions, and filling up the tracery of some of the windows with masonry in lieu of the original glass. An inventory of the Abbey while complete mentions, besides the church, a house called a 'Council House,' (Chapter House?) a chapel called "Tonhill Donelan's Chapel," six chambers with fire-places, twenty-eight small chambers or dormitories, three orchards, six gardens, a mill and water-course, and sixty ash-trees. Tradition points out the site of the mill, but the water-course must have been considerably diverted. Of the ash-trees, one only remains, which, from its great size, must be of considerable age. It grows in a very extraordinary position within the walls, and against the East window of Tonhill Donelan's Chapel. The trunk, at the height of six or eight feet, divides into two arms; one grows out through the window, the other upwards, but both unite their branches above the wall in one mass of foliage. The position of this tree fixes the ruin of the chapel at a remote period; even though the chapel is shown to be an addition to the original building, by its character, and by not being "tied" or "bonded" into the work of the transept. There is no doubt that Kilconnel Abbey, in its pristine condition, was a very important establishment in the West; and that it had many endowments from numerous ancient families about it, whose descendants are still existing. Many interesting reliques have been from time to time found in the locality, particularly in a small swamp or morass to the North of the Abbey. It would appear, that at the destruction of the monasteries the friars or monks took the precaution of concealing their valuables in the adjacent bogs, either on account of the supposed preservative qualities of the turf, or of their being secure from discovery by marauders. From this cause, no doubt, the small bog near the Abbey of Kilconnel retains to this day the cognomen of "Moan-na-mraihar," or "Friar's Bog," and various reliques of the old Abbey have been found in it from time to time. Some years ago, an ingot of fine gold of considerable value was dug up.

Like those of most communities of the class, the founders of this took good care to secure a spot where fuel and water were abundant. In addition to the excellent running stream alluded to, there is a spring to the North, of the most exquisite quality. It is commonly called the "Lanthorn Well," but I find that the proper appellation is "Lanfiera's Well," the name, I should conjecture, of one of the abbots, or of a local saint. In most other Western monasteries, such springs are generally called "Holy Wells," and are commonly reported to possess healing qualities for all diseases.

The entire structure of Kilconnel Abbey is built in flat courses or layers of flint, and flags of various sizes and qualities, principally self-faced. It has as good an effect as the most perfect style of masonry. All the finer or wrought work is of the exceedingly hard limestone peculiar to Ireland, but found nearest to Kilconnel at Brackerna, near Ballinasloe, about twelve miles distant. The very hard quality of this stone has allowed the highest finish to be given to all the work, and the greatest exactitude to every detail; while such is its state of preservation, that the chisel marks are as fresh as might be expected only a year after completion. The marks are very fine, in consequence of the sharpness of the tool required to disintegrate the stone; but they still remain, and, with one exception where the stone is rubbed or polished, they form the finish of the work. Doubtless, the expense of first class artisans to work this stone, and the labour and time it must have required, have occasioned the introduction of a small amount of ornament; but wherever it does appear, it bears the impress of masterly and free treatment. We cannot attribute the use of this very hard material to anything but the necessity of using local materials, but the result is forcibly in favour of hard stone in monumental buildings, with a small amount of ornament accurately finished, in preference to many ornaments badly executed in soft stone, and the consequence—early decay and premature destruction.

Every traveller who has given his ideas upon these structures has emphatically pronounced them to possess a very foreign aspect. Probably in none is this more evident than in Kilconnel, whether viewed in the mass, or in the detail. One of its greatest peculiarities is, (should my assumption of the date not be erroneous) that, while at the period of its erection Perpendicular Gothic was the only style practised in England (and to a far greater extent than the preceding ones), we do not find any evidence of the slightest influence of the English style or taste at Kilconnel, so far as broad principles give scope for consideration. But in France and other continental countries, where the Perpendicular never obtained proper hold, we find the same flowing style as that of Kilconnel, and just about the same period. The East window, the South transept and the chancel windows are decidedly Flamboyant, and entirely devoid of any cusping. Of all the traceried windows, the South window of the aisle alone is cusped, and has any impress of English character; and this only if Mr. Garbet is correct in asserting, in his "Rudimentary Treatise," that the difference between our own flowing style and that of the Germans and French is, "that while the upper ends of our loops or leaves are round or simply pointed, *i. e.* with *finite angles*, the upper ends in France terminate like the lower, in *angles of contact*." The only English windows showing the same mode of treatment as this which I can call to mind, are the West window at York Minster, and a window in Kirton church, Lincolnshire. The square headed Tudor looking windows in the aisle of the nave are very well executed, but too much frittered away in lines and small members. Another difference in respect to the windows is, that while in England they are generally recessed with a bold single or double chamfer, or otherwise more deepened and moulded, in Kilconnel they are fixed in every case within an inch, or an inch and half of the face of the wall, and sometimes flush with it. This I consider to be a decided fault; æsthetically, because it deprives the window of shadow necessary to give it boldness; and, constructively, because it tends to expose it more to accident. Many of the windows have no splay inside. The three-light window above the eaves line in the South wall of the chancel must be a much later addition.

After a few leading elements in the nave and chancel, irregularity and want of symmetry seem to be the prevailing features in Kilconnel Abbey. The windows do not correspond with the nave arches, and equidistances are almost disregarded. Arches differ in height and span, and those parts which, notwithstanding the irregularity of outline, generally exhibit some degree of balance, are here irregular. Except in the principal windows and in some doors which have equilateral heads, all the arches approach more or less the semicircle, or are very flat in comparison with their span. In England, about this period, this effect was generally produced by four centred arches; but here it arises from the striking centres of the arcs being set nearer the positive centre of the arch. In the nave this is the case. In the cloisters, the arches are nearly round; and in the transept they are so slightly pointed, that a practised accurate eye alone can detect their true form. This method gives an opportunity of combining the perspective grace of the semicircular arch with the structural stability of the pointed. The archivolts are either entirely square, as in the cloister; or they have an additional square rib to the intrados, as in the nave and transept; these are sometimes chamfered, as in the tower. The excellent constructive precaution of beginning the relieving arches considerably above the haunches, so as to bring the thrust more perpendicularly on the pillars, has been followed in every case. There is no trace whatever of a buttress in any part of the structure. In all probability, the necessity of making the walls very thick in consequence of the description of masonry employed, combined with the circumstance of the roof being of wood, obviated the requirement of any buttresses; and a plinth is also superseded by giving the walls a batter from the ground-line to about six or eight feet above it.

It would appear that the transept and aisles were a sort of after-thought in the erection of the main structure,—but that both were built during the same period cannot, I think, be for a moment doubted. Not so, however, "Tonhill Donelan's" chapel. This certainly, as previously stated, must be an addition subsequent to the main erection. I presume that "Tonhill Donelan" erected this at first as a mortuary chapel, and that afterwards it was used, in conjunction with the transept and aisles, as a chapel for the general services; high mass and the more solemn ones being performed in the chancel. Squints in the side arches, now almost effaced, enabled the worshippers to participate more easily in the services at the altar at the East end. The piscina in this little chancel is of the most exquisite finish, and seems to be of a different material from the rest of the work; a sort of dark marble, which had at one time, no doubt, a fine polish. The arches have the same characteristic as those already mentioned, *i. e.* a near approach to the semicircle; and the pillar, its antæ and their capitals and bases, have very free and beautiful profiles. This piscina is, perhaps, one of the most finished and exquisite pieces of work in the whole fabric. Indeed, it is more reasonable to assume that it was removed from another site in the church and inserted here, than that it is of a contemporary style with Tonhill Donelan's addition. The other piscina in the transept also shows highly finished workmanship. There is little doubt, judging from the height of the East window above the floor line, and the racked appearance of the wall, that a reredos existed above the altar; but the place is now so encumbered with tombs and ruins, that it is impossible to arrive at any satisfactory conclusion. There is no trace left of sedilia or a piscina, in the chancel, though it, no doubt, possessed them; and the fact of two piscinas being found in one small chapel, made up of various parts into what might be termed the "Lady Chapel," leads to the conclusion, that the most important and solemn portion of the edifice would also possess these adjuncts to an extent commensurate with its importance.

The roof must have been an open timbered one; the stone corbels, of the plainest description, which supported the ribs, still remaining in many places, particularly in the chancel.

The distribution of the little amount of ornament to be seen is singularly peculiar. A few leaves are found on one of the main springing courses (and only on one) of the tower. An angel with a book supports one corbel only of one of the tower arches; and in one corner, above the springing of the arches, an owl is carved in bold relief, as if stuck against the wall. At the junction of the nave and transept aisle, is a springing stone of nearly the same profile as the more elaborate capitals in the transept, but having a running fleur-de-lis on the frieze. In other places small scroll devices, little bits of leaves, &c. are found.

The tower is a remarkably strong and solid structure, the walls retaining their thickness for nearly their whole height. The floor is nicely drawn to the square by a series of discharging arches—the groined cieling under is of excellent workmanship and finish, having no bosses at the intersections of the ribs, which are too often the means of concealing indifferent work. The whole is well done, and "line meets line" with geometrical exactness. The stepping in of the upper portion of the tower leaves considerable spaces outside to the North and South—these are but very slightly weathered, and in so peculiar a manner as to render their use a mystery. The weather stones, each in two steps, are hollowed considerably in the middle in the direction of the drip, so as to resemble tiles; and each of the platforms has a door at about its own level, but about six feet above the floor in the tower—its purpose I am unable to conjecture. The most remarkable feature in these monastic towers, all of which in some measure resemble the one in question, is the termination, which entirely differs from anything of the kind in Great Britain. All those I have seen are finished in the same way, or at least on the same principle. Those of Jerpoint, Clare Galway, and Abbey Knocking, may be cited as instances. Above the top string course (it cannot be called a cornice) is a series of oblong holes through the parapet, carrying the water from the roof to the drip of the string course. These, at some little distance, produce almost the effect of large denteles reversed, and give a peculiarly pleasing weight and importance to the upper portion and battlements. Such battlements, according to Fergusson, are identical with many found in the North of Italy.

The tower contained some excellent bells, but the number is doubtful. If a peal, they would, in all probability, be rung from the floor carried by the present groined vault; but as there are two rope-holes in this floor, it is likely that there were only two bells, and that they were rung from the ground-floor, or the one above. There are, however, housings in the walls at the top of the tower sufficiently large to admit the framing for a peal of at least six bells; but the windows, or sound holes, in this part are too small for such a peal to be safely and effectually rung. One of the bells of fine and powerful tone was discovered in the adjacent bog, but after being kept for many years it was accidentally broken and disposed of.

The Abbey, in its finished condition, must have possessed many splendid monuments and tombs, but most of them, from wilful destruction, or neglect, are entirely defaced. That in the nave, however, near the West door, would be found, were the ivy removed, to be in a tolerably good state of preservation. The altar part of this tomb I should consider, from the character of the figures, to be a century or more earlier, but the canopy and its adjuncts belong to the date of the present church; and if the lower part *is* older, it has most likely been transferred from some older structure that occupied the same site. The canopy is a splendid piece of workmanship of very delicate finish and adjustment. Fault may be found with the multitude of small members into which it is cut up by the alternate hollow and round mouldings, but the accuracy with which these members are mitred upon spherical lines deserves great commendation. The character of the tracery is as Flamboyant as anything in France or Germany, and certainly different from anything of the kind in England that I am aware of. There is no history of this tomb extant: it belongs to the "Keogh" family, and is commonly called "Miss Keogh's tomb." The monument to Hyacinth Daly in the chancel was, with other portions of the remains, blown down by the great storm of the 6th of January, 1839. I am indebted to the Rev. John Day Collis, for a rough sketch taken before its fall, from which my drawing was made. The tracery, it would appear, was entirely of a geometrical form, or at least composed of circles and segments, inscribed and tangential: it is the only portion showing exact geometrical properties I have found connected with the building. This monument, though commonly called Hyacinth Daly's tomb, is the family vault of the Dalys, of which the present Lord Dunsandle is one of the principal members. There is little doubt that there once existed a superb monument to William and Malachy O'Kelly, the founders of the present structure, but not a vestige remains. None of the tombs seem to have had recumbent effigies, so frequently seen in England.

I have tried in vain to discover any portions of the inside covering of the walls, though they have evidently been plastered. My object was to discover whether any frescoes remain, as it is certain that many of these buildings had very valuable ancient pictures of that description. It is very highly probable that Kilconnel was similarly decorated, as all the wall space to the North of the nave and chancel was available opposite the full light from the South. There can be no doubt that the larger windows had stained glass, as many pieces have been discovered among the rubbish. We do not often find that frescoes and stained glass combined produce a good effect; the brilliancy of the transparent material not agreeing with the opaque dulness of the other. This is observable in Italy and the brighter Southern countries. In the present instance, with but a very moderate light coming from one direction, I cannot see that their combination would be at all incompatible. The flood of light from the South would fully illuminate any frescoes on the North wall; and the subdued light from the East and West would give ample scope for stained glass, without producing any overwhelming brilliancy. Indeed, the light, particularly in the nave, must at all times have been much subdued, as in the Italian churches.

There is nothing in England, of which I am aware, that at all resembles the cloisters at Kilconnel. In England, the cloisters generally consist of a series of windows lighting a quadrangular passage; but those at Kilconnel and the neighbouring monasteries exhibit a series of open arcades, supported by pillars; either single oblong piers, as at Moyne Abbey; or double pillars, though not exactly detached, as at Kilconnel. The latter are a sort of simplified arrangement of those found at Huelgas, near Burgos, in Spain; and at Fontevrault (though the latter are not pointed) in France. They have imposts, capitals, and bases (however plain) similar in arrangement to those mentioned, but not detached, and pointed arches of stiff radii, and flat intrados. It is very evident, that, like the Spanish and French cloisters, those at Kilconnel were never glazed. The arches very nearly approach the semicircle. Diminutive as these cloisters were, their uncovered area being only 22 ft. square, they seem to have been divided in the middle by a partition or arcade running East and West, the purpose of which I am unable to conjecture.

Of the monastic buildings, there are but comparatively few remaining at Kilconnel, and those the least important. They are, however, in tolerable preservation. The general plan of these monasteries may be described as an irregular quadrangle; with square cloisters as the centre, surrounded by the church on one side, generally the North (in this instance the South), and by the monastic buildings on the other three. The only one of the existing apartments possessing a name is called the "Strangers' Room." I presume it was appropriated to benighted travellers, who always obtained bed and board, as well as other relief, at these institutions. Above it is a well-lighted room, which I conjecture to have been the "Abbot's Oratory," an apartment generally placed at the East end of the church. A large mass of masonry with recesses was, I presume, the cooking fire-place of the establishment; and I have called the apartment in which it is found, the kitchen. The other apartments—as the refectory, chapter-house, &c., I suppose occupied the respective positions I have assigned to them; while over all, excepting probably the chapter-house, extended the dormitories and remaining portions of the establishment. One building, connected with the main body by a blank wall, remains in a very good state of preservation. It has two stories, the upper one lighted as the dormitories, but the lower entirely dark, the only entrance being from the East by a narrow doorway 18 inches wide. I can assign this building to no other use than that of a refractory cell or prison, with a keeper's lodging over it. There are ruins lying still further to the North of this building, which indicate that the establishment extended over more ground than at present. Many large tombs and ancient tablets, dating as far back as the Commonwealth, are to be found in all parts of the church; and the monastery seems to have been the place of interment for various ancient and important families for miles round.

In conclusion, I venture to express my opinion that the architects of all these Western monasteries, Kilconnel in particular, were either foreigners; or that, if natives, they studied in foreign countries, and thence imported the style into Ireland. The latter opinion is perhaps the more correct, as it is very probable that, as in England, the bishops and clergy of the middle ages in Ireland were their own architects; and it is well known that students from Ireland went into Italy and Spain to be ordained, where it is not improbable that they studied the elements, and imbibed the principles of architecture which they subsequently transferred to their native country. Indeed, not only in the style of architecture here treated, but in all the Irish architecture of a much more ancient date, this foreign influence is always to be remarked. English feeling, or the influence of English style, is not apparent in either. This would not be so much matter for surprise, notwithstanding the close proximity of the two islands, had there been no connection between them in an imperial point of view; but when we find that, at the period to which these remarks especially apply, Ireland was under the almost absolute domination of the English, it must be considered remarkable that some English spirit was not infused into the vernacular architecture of the country, more particularly at that advanced age. On the other hand, when we remember that the Irish chieftains and their followers never could brook the yoke of their English subduers, and that at the time Kilconnel and like abbeys were built, that is, the commencement of the fifteenth century, the country was subject to serious and continual disturbances, we may understand the reasons which may have prevented the adoption of any English type. Again, we find in almost all other countries contiguous to each other, foreign influence apparent in some shape or other. Thus, in France, we occasionally find German influence, and *vice versâ*, in Spain, we find French, and in Italy we find even English influence. But in Ireland, at a short a distance across a narrow channel, where English influence in other respects prevailed, and where, according to Hardiman and Debrett, some of the founders of these western monasteries must have been of Anglo-Saxon blood, there is scarcely anything to indicate the union of the two countries, while there is everything characteristic of the spirit and thought of more distant climes and more foreign impressions.

There are many abbeys in the counties of Galway, Mayo, and Clare, which, if properly investigated, might throw much light upon a mystery hitherto not fathomed. It would be very interesting to the antiquary to discover some definite reason for the Southern influence prevailing in the Mediæval architecture of the sister isle; and why she should, in that respect, be so much alienated from this country, with which she was otherwise so nearly connected. There is food enough for the archæologist among these ancient structures, to enable him at least to arrive at a conclusion whether their characteristics are entirely foreign, or whether they were, in any degree, affected by the influence of Great Britain.

Mr. Donaldson, H.S.F.C., said that Mr. Blake's paper contained much useful and original information, and he was glad that an Englishman had come forward to illustrate the antiquities of Ireland in a manner not hitherto done by Irishmen themselves. It was to be regretted that Ireland had not had the advantage of a man like the late Mr. Britton, to take up the monuments of the country seriatim, and bring learning and art to bear upon their illustration. He, however, could not altogether agree with some of Mr. Blake's remarks, particularly the suggestion that foreign influence had operated extensively in the works referred to. The Flamboyant character of the tracery of the tomb and windows could hardly be taken as a proof of their French origin, and he believed that the Irish, like the Scotch, had a style of Gothic peculiar to themselves. Kilconnel Abbey represented a large class of religious buildings in Ireland, in all of which there was a remarkable identity of detail. He would call the attention of the meeting to a plan and general view of the Church at Kilmallock, drawn by himself, showing its great similarity in arrangement and design to the Abbey of Kilconnel. Kilmallock was of the Lancet period, and had buttresses, which, as Mr. Blake had stated, were wanting at Kilconnel. The cloisters in each case occupied a similar position. It was evident that the two buildings had been designed with the same sentiment. The tower was a striking feature in both, and in many similar buildings in Ireland. At Drogheda the tower alone remained, the rest of the building having been destroyed. The dark lias limestone, of which these edifices were constructed, took a good polish, but its colour being almost black had an unfavourable effect, and was not sufficiently relieved from the surrounding landscape. The peculiar openings near the summit of the tower, which Mr. Blake had described, were for the purpose of discharging the water from the roof. They were of frequent occurrence in towers of this kind, though varied in detail: on a future occasion he hoped to describe them to the Institute.

Mr. Nicholl, Associate, said that he had visited several of these monuments of Irish architecture. It appeared to him that the later examples displayed a bad imitation of early work; as if executed by men who had seen good architecture abroad, and endeavoured to reproduce it from memory. Although in the cloisters of Kilconnel the details were bad Gothic, the general effect was very pretty. Mucross Abbey and Quin Abbey, in Clare, were similar in character to the subjects before the meeting. In the little village of Adare there were three abbeys, having details also of a similar nature. The small room adjoining the chancel on the north side at Kilconnel was, he thought, the sacristy, the room above being the treasury. The cloisters resembled those of Mucross, and also fragments which existed of the cloisters of Ballintubber, in Mayo. The latter church was very perfect and interesting. It was founded in 1216; its general character was Romanesque, and the detail decidedly good. It had a vaulted choir, and presented one of the few instances of the high altar as originally erected, and constantly used, with very rare and short intervals, down to the present time. This was, indeed, almost the only altar of the thirteenth century which he knew of still in use. The appearance of imitation was the most striking point in the works under consideration. From what source they were derived he could not say, but he did not think they were at all influenced by English taste. Art did not appear to have been fostered or advanced in Ireland by English rule during the Middle Ages; *e. g.* the spire was not introduced, the few examples he had seen being quite modern, and, with one exception, confined to edifices belonging to the Establishment; and even now it was regarded as English, and as appertaining to the Protestant Church. The gutters at the top of the tower at Kilconnel were similar to those at Adare. In reply to Mr. M. D. Wyatt, Mr. Nicholl said he was unable to account for the doorway at so high a level in the tower of the church, but doors were found in very peculiar positions in other Irish buildings; he did not think they were made for the purpose of discharging missiles; the battlements on the summit of the towers generally were very slight, and it did not seem to be of a defensive character.

Mr. M. D. Wyatt, H. S., said, that the Mediæval buildings near Dublin, "within the pale," which he had seen, were decidedly of English character, as in the remains at Trim and Mellifont; but those of Kilconnel, Kilmallock, &c. appeared to be of a ruder class. They were produced by imperfectly educated architects, and less skilful stone masons; and he agreed with Mr. Nicholl in thinking that the elements of originality which they displayed arose from a stern necessity to supply wants similar to those which had been supplied by artists more skilful than the Irish, who remained comparatively unacquinted with, and isolated from, the experiences gained by the great masters of the craft. The Irish, in fact, invented to the best of their ability, from a want of knowledge of what others had done. He did not remember having seen an ancient spire in Ireland.

Mr. C. Barry, Fellow, congratulated the Institute on the present paper, as an illustation of Irish architecture, to which the Council had endeavoured to call the attention of the profession. The architecture of Scotland had been illustrated by Mr. Billings, but Ireland had been peculiarly neglected. As architects should be also archæologists, and possess a knowledge of the styles of all times and countries, it was very desirable to consider the architectural monuments of Ireland, the peculiarities of which had yet to be developed. It was hardly fair to judge of these works by the example illustrated on this occasion, and certainly he had not felt the same interest in it which he should have in many of the more important English or Scotch monuments with which they were better acquainted; but it did not follow that there were not other buildings in Ireland deserving a more detailed examination.

A vote of thanks to Mr. M. D. Wyatt, for reading the paper, was put and carried, and the meeting adjourned.

WAYSIDE MEMORANDA OF AN ARCHITECT DURING A TOUR IN IRELAND, MORE ESPECIALLY WITH REFERENCE TO SOME OF ITS ANCIENT REMAINS.

By Thomas L. Donaldson, Hon. Sec. F.C.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, April 26, 1858.

I was commissioned by the Government, in the autumn of 1855, to proceed, with J. Wilkes, Esq. and Spencer Shelly, Esq., to examine into certain allegations respecting the Lunatic Asylums then recently built in Ireland, and to report thereon. During the intervals of application to more serious and responsible duties, it was impossible for me, as an architect, to pass by numerous curious remains of antiquity in a country so little known to us upon that point. I could not avoid observing many peculiarities of taste and execution, which seemed to me worthy of more minute attention than I was enabled to give, for I could only bestow an occasional spare hour or two, where days could have been well spent.

My remarks therefore will be necessarily of a general nature; but this will be of less importance, as the paper by Mr. Blake on Kilconnel Abbey, and that by Mr. Gordon Hills on the Round Towers, recently read, have anticipated some remarks on those subjects I might have made, but which are now rendered unnecessary by their more complete researches.

The first important city north of Dublin is Drogheda. Many associations, historical as well as natural, give great interest to the name, as one of the leading seaports on the eastern coast of Ireland. It occupies both sides of the rising banks of the Boyne, here spanned by the stupendous railway viaduct, which rises 90 feet above high-water level. The centre opening has 250 feet clear water-way, and there are two of 125 feet span and fifteen of 61 feet span, leaving clear openings of 1,450 feet, independantly of the piers. The view from the south end, as the traveller stands at so elevated a point above the water-level, embraces the whole course of the Boyne down to the sea, bounded on each side by woody banks, while to the west the eye turns upon a fine expanse of country, reaching to the scene of King James II's defeat by King William.

There are several mediæval remains in the town, the most perfect of which, St. Lawrence's Gate, to the north, is a majestic mass, consisting of two fine circular towers, with a square space between the two about two-thirds as wide as one of the towers, and in which is the gateway. There is not a single horizontal moulding from bottom to top; they rise straight from the ground to the summit, where there are embrazures, divided by stepped parapets. There are several slit openings for light and air, and four or five larger apertures, possibly of later times. The face towards the country presents only the towers and the simple square space between; but towards the town the central part is recessed, with an arch over, and I think there must have been open galleries of communication between each floor of the two towers. The back part of the gateway inside is further protected by a projecting enclosure.

Another ruin, called Saunders' Gate, evidently the central tower of an old church, rises up with peculiar majesty. It is held in great veneration, so that the enclosure in which it stands is much used as a burial place by the Roman Catholics. This ruin presents a feature, one of a class prevalent in Ireland, and to which I shall have hereafter to refer, in a tower rising over the crypt of the church. A noble arch spans the central opening, which is flanked by solid masses of rough rubble construction. The square tower rests with majestic dignity on these piers, and rises two stories high, with a projecting staircase at one of the angles. The windows of the two stories still retain their mullions and traceried heads, but the upper part of the parapets and embrazures are destroyed. A great knowledge of constructive skill is evinced in the present position of this tower, which stands firm on the dilapidated piers without any buttresses at the angles or from the masses beneath, to contribute to its stability. It is a striking fragment of bye-gone times, and speaks of a noble church, that once covered the area, perhaps with monastic buildings attached and the residence of a religious fraternity. It is now surrounded by wretched hovels, and the very grave-yard, with all its holy associations, betokens desecration, neglect, and decay.

There are several other monastic remains in Drogheda, mixed up with commercial warehouses and used for ordinary purposes, which would doubtless yield much fruit to careful investigation. But my three or four hours, including a visit to King William's famous passage of the Boyne and a peep at the pillar erected to commemorate his victory, did not allow me to take other sketches in this town.

Between Drogheda and the Giant's Causeway the tourist passes through Belfast, which has now many fine commercial buildings rising up, mostly due to the skill and taste of Mr. Lanyon, who, as county surveyor, has formed hundreds of miles of the finest roads possessed by any country. The rocks of the district afford a very fine material for the purpose; but whether traversing bogs, passing along mountainous ridges, or skirting the shores of the Irish Sea, the roads are broad, solid, well protected, and presenting scenes of beauty and ever varying interest.

A solitary round-tower at Athlone was the only object of antiquity that crossed our path northwards; but in the absence of monuments of art, the majestic columnar groupings and rocky precipices of the Giant's Causeway made us feel that we stood in the centre of one of the most glorious temples of the Almighty's own creation. In fact, in the North of Ireland, where Scotland has sent her sons as settlers, so that the descendants outnumber the original inhabitants, the Presbyterian and utilistic element has produced nothing of a monumental or architectural class. Among men, simple, unpretending, thrifty, and devoted to utilitarian objects, the art element has found no response in this part of Ireland. Even in Londonderry itself I did not find a single object worthy my pencil, and it was not till we got to Enniskillin that Irish antiquity and mediæval art began to indicate themselves.

Devenish Island, on Loch Erne, is famous for its lofty round-tower, which stands alone from a commanding height, and is seen from a great distance. Mr. Hills has already described this, and alluded, as well, to the ruins of religious buildings in its immediate vicinity.

As we pass down the stream from Enniskillin, which communicates between the upper and lower Loch Erne, we find on the left bank, at the opening of the latter, Portorra Castle, a regular fortified post of the middle ages. It consists of a square enclosure about 74 feet by 60 feet from out to out, with a circular tower about 15 feet outside diameter at each of the four angles. The chieftain's dwelling, which is of modest pretension and was two storeys in height, occupies one end between two of the towers, and has a depth from outside to outside of wall of some 22 feet. A curtain wall about 3 feet thick surrounds the three other sides of the court, with the entrance to the fort in the middle of the side facing the chieftain's quarters. The towers have an inner free space of 10 feet 3 inches diameter. They consisted of two or more floors, and thus afforded sufficient accommodation for a small garrison; but, in cases of emergency requiring a more numerous armed force, barracks and sheds could be run up inside the court, backing against the curtain walls.

I venture to break in upon the regular course of my route by at once, for the sake of comparison, describing Mallow Castle, which is on the main line of railroad to Cork. It is situated in a beautiful domain of some extent, and on the summit of a rapidly-rising bank, on which the finest trees and shrubs grow with wild profusion. Above all this verdure rises the majestic mass of Mallow Castle, with its quaintly-placed angular turrets and its peculiarly-planned entrance tower. The body of the castle occupies a parallelogram, exclusive of the projecting tower, of about 91 feet by 37 feet, outside dimensions, the walls being from 4 feet 6 to 5 feet thick. The porch occupies the centre of the elevation, its face being bevelled, with the edge in the middle; and the doorway is on the return. There is a small inner lobby, with a fine room to the right and left, about 31 feet by 27 feet, and a long room in front, carried out so as to extend 21 feet beyond the back front, with a square projection, and again a bevelled face like the entrance porch, only more acute in plan. At each angle of the principal front is an hexagonal tower, placed diagonally, apparently for the purpose of more complete defence and command of the front, and in one of them is the staircase to the upper floors. The whole is now a ruin covered with ivy and other parasitical plants; the floors are gone, but there are traces of a basement-story.

It will be perceived that at one end the walls are continued on; but it is difficult to decide whether this may not be an addition subsequent to the original erection, as would seem to be indicated by the position of the tower. There are considerable traces of other additions, as also of outer fortified works, as though the castle had been in the centre of a court, and surrounded by an enclosure of fortifications. The date of the castle seems to correspond with our Edwardian period.

The village of Mallow has a fine mineral spring, and is consequently one of the inland watering places of the south. A fine bridge has recently been completed over the river Blackwater, which is a stream of some reputation.

I will now also allude to Dunluce Castle, about five or six miles west of the Giant's Causeway. It stands crowning a lofty rocky projection, which stretches out into the sea, and the communication with the main-land is by a one-arched bridgeway, now only 2 or 3 feet wide, and forming a hazardous approach to any traveller who has not a very steady head.

Wandering in Ireland brings us acquainted with a class of miserable hovels, even in important towns, which may occasionally be met with in out of the way spots in England or Scotland, and as an exception: but they painfully obtrude themselves upon the notice in large groups, particularly in the middle and southern parts of Ireland. I allude to the cabins of the peasantry and lower orders. They are one storey high; the walling sometimes consists of some large blocks of stone at the quoins and doorway, and the rest built of smaller rough pieces. The roof is of thatch, enriched by a profuse vegetation of all sorts of weeds and plants. In most a chimney rises through the roof, but frequently a mere aperture is left in the thatch, lined by small pieces of board, and through that the smoke pours from the peat fire within. The whole is most rudely put together, the only care being to keep out the cold. The smallest window, with the greater portion of that blocked up and only admitting light through a square or two of glass; the mere earth as a floor, and with the slightest separation to divide one part from the other. A dung-heap in one part, and a reeking pool at the door; the ass, the pigs, father, mother, and children lead a happy life in common, mixed up with dirt and smells anything but fragrant to the casual visitor. And ah! how often did we find rows of such wretched hovels unroofed and dismantled, perhaps a lonely one remaining, inhabited by some sturdy obstinate occupant: all around desolation and ruin, but still his own, a desirable home, if it kept out the wind and rain. How strange did it seem, to find associated with such misery and privation the gay, good-humoured and witty peasant, ever ready with his joke and to indulge in a piece of frolic and fun.

Killmallock is about sixteen miles from the busy and opulent commercial town of Limerick, and was formerly a town of still greater note; so much so, that letters directed to its rival were formerly directed Limerick, *near* Killmallock. Here are the ruins of city walls, mansions, towers, churches and monastic establishments; it was walled in, and the walls, of considerable thickness, rising 5 or 6 feet above the ground, can be traced for a great length. One of the entrances, called the Blossoms Street Gate, still remains well preserved, as shown in the illustration. The High Street contains numerous important mansions of wrought stone, rising up majestically with lofty fronts, the tracery remaining in some of the window openings, their gable-ends towering above the adjoining modern erections. Their noble fire-places, of bold and striking proportions, peculiarly designed, and of a character prevalent in Irish architecture of about the Elizabethan period or a little earlier, remain undisturbed in their original positions. The joints of the strings along the front are protected by a curious and ingenious hood moulding. Killmallock has a greater share of magnificence, even in this miserable state, than any town in Ireland, and a learned and ingenious writer particularly calls it the Baalbec of Ireland. The inquisition of the Chief Remembrancer, 11th August, 29 Eliz. (Archdall, p. 810) finds "that there had been an abbey or religious house in Killmallock, known by the name of Flacispaghe, on which a stone house was erected, and which house, with an orchard or garden belonging thereto, was found of the annual value of 6*s*. and 8*d*. sterling.

We may suppose this to be the church and monastic building illustrated on the drawings. It corresponds in arrangement and general disposition with Kilconnel Abbey, described on a previous evening by Mr. Jas. Blake. The church consists of a nave, tower, chapel and choir; the tower in its usual place, crowning the intersection between those principal features, upheld, like that of Drogheda, between stone piers, and rising several storeys above the roof, and thus forming from without a prominent and lofty object. Immediately adjoining and on the north side, are the cloisters and dwellings of the monks. There is the kitchen building, with its kitchen and other dependances, and the refectory immediately adjoining, with its vaulted ceiling; above which is a large hall or dormitory. Attached to the choir is probably a vestiary, in the space indicated on the plan. The effect of the choir, with its numerous windows with lancel heads, must have been very fine. There are numerous recesses in the walls, as for tombs, and the whole displays a considerable degree of past magnificence, and some of the windows are very gracefully composed. The perspective view shews the general state of the building.

Killmallock Church is still partly used as a place of Protestant worship. At the north-west angle is a circular bell-tower, by many, and by Mr. Gordon Hills, supposed to be one of the ancient round-towers. But to me it conveyed a different impression. The circular strings of mouldings and the rapidity of the diminution makes it, in my mind, belong to the common class of circular belfry towers, like that of Hadiscoe Church, Essex, shewn in Cotman's engraving. It evidently had had no roof, for the embrasures still exist. But perhaps the most valuable portion of this church for our purpose is the parapet and roof of the south side aisle, which explain the peculiar mode in which the ancient Irish architects carried off the waters from the roof. The parapet was crenellated. Immediately abutting against the parapet were hollowed slabs of stone, the sides of which rose up like the tiles of the Greek temples. These tile slabs were 1 foot 10 wide, and 6 inches apart. The space between the two was covered by a hood-tile, the sides of which fitted with the sides of the tiles, and thus threw the water into the centre of the latter, as in the Greek temples. Thus the waters were discharged directly outside through square holes cut through the parapet. The rest of the roof is formed with the usual slating slabs, in the ordinary way. The coincidence between this arrangement and that of the Greeks is remarkable.

Another illustration of arrangement peculiar to the Irish exists in a square church tower. The parapets are crenellated and stepped, as usual in them. Inside the parapet the roof rises with a pitch; but instead of abutting against the parapet, there is a flight of steps up one side of the roof and down the other at the ends, affording easy communication, and the opportunity of using the embrasures with effect and safety.

From Kilmallock I proceeded, after a four hours' stay and sketching, to Gould's Cross; and although Holy Cross with its rare and curious remains was so near, I was obliged to forbear visiting it, as the daylight was receding, and I had a six miles' drive, ere I could reach my home for the night at Cashel, in Tipperary, which gives the name to the bishopric. And never shall I forget the agreeable ride that I had in one of Bianconi's cars through a most pleasant country, and the cheerful companion of a driver pushing on as rapidly as we could to reach this venerable place in the twilight, at least, ere the sun had completely set behind the hills. For a half-dozen miles off one can see a conical hill rise out of the general surface, crowned by buildings, with gable-ended walls and a round tower, recalling in many of its features Mount Cassel, near S. Omer, in France. As we approached, the evening grew darker and darker, and the sacred mount, as a black mass, displayed its features distinctly in outline, with a glowing setting sun as a back-ground.

The next morning I rose with the sun, and from the town directed my steps to the summit of the hill, on which stands the cathedral, dedicated to St. Patrick, with a castle attached to it at the West end, a round tower near the N. E. angle of the North transept, and on the South side, the Norman chapel, called that of Cormac, who was killed in battle in 908. It is possible that there may have been here an earlier chapel than the present one, founded by Cormac or in honor of him, subsequently replaced by this more elaborately-enriched Norman building, as the date is too early for the existing one. The whole of these buildings were enclosed by fortified walls, with towers all round, which have now disappeared; but there still remains, near the entrance to the sacred precinct, the vicar's coral hall. The greater portion of the cathedral seems to be of the 13th and 14th centuries, but some parts are later, as also the castle, which contains two remarkable chimney pieces. The mantel of both consists of a flat arch, the stones keyed into each other. One has a hood, which causes a projection to the flat arched mantel, one end of which abuts against a wall; but in order to resist the thrust at the other end, which projects, there is an horizontal buttress acting as an abutment.

Some idea may be formed of the importance of this sacred foundation, when, from this elevated position, one can see five ecclesiastical establishments, once connected with it as so many dependencies, and giving dignity and power to the rock-built cathedral towering above. Within a short distance, occupying favored spots all around, are St. John the Baptist's Parish Church, Hoare Abbey, the Dominican Abbey, the Roman Catholic Chapel on the site of the Franciscan Abbey, St. Nicolas' Abbey, and St. Mary's Abbey; which would doubtless afford a rich harvest of discovery to any one, who had the time and necessary intelligence to do justice to such important subjects of study.

Kilkenny is a town of great importance on account of its striking antiquities, and even of its modern buildings. The Castle, the majestic seat of the Ormond family; the Cathedral of S. Canice, with its round tower; Black Abbey; the modern Roman Catholic Cathedral, which rises with overpowering grandeur above the general line of buildings, and the Lunatic Asylum, are only a few of the many remarkable edifices, ancient and modern, that deserve the attention of the traveller and the artist. The tower of Black Abbey crowns the intersection of the nave and transepts, and is a fine illustration of the fortified arrangements of even the sacred buildings of early Irish history. The four angular turrets are square, and have their parapets crenelated with square pinnacles at the angle, rising above the general level, the whole group forming a turreted turret at each angle of the main tower. The main parapet of the centre has an embrazure in the middle, and on each side the parapet is stepped, and the whole has a slight projection from the general surface of the tower, as low down as what may be presumed the flat of the tower. In like manner the parapets of the clerestory walls of the nave are crenelated and stepped, forming an overhanging parapet, supported on corbels, and perforated at small intervals, so as to allow the immediate discharge of the waters from the roof without any gutter parallel with the parapet, as at Killmallock. The inside of the church has many antique memorials, and on the outside near the entrance porch are some fine simple stone coffin heads, carved in relief or with sunk lines, as shewn in the illustrations, of crosiers, shields, &c., and one with the mere head of the deceased in high relief. They are of the black marble of the county.

The Round Tower, within 6 feet of the south end of the south transept, rises to a height of 95 feet 8 inches from the ground to the moulding of the first course of the conical roof, which still remains and gives the inclination or pitch. The lower diameter from out to out equals 14 feet 9 inches, the walls being 3 feet 3 inches thick. The upper diameter from out to out is 11 feet 7 inches, with walls 2 feet 8 inches thick, and six square window openings, 1 ft. 5 wide and 3 ft. high. The diminution in the thickness of the wall is gained by offsets inside, apparently arranged to suit floors at certain heights. The door is at the height of 9 feet 4 inches from the ground, 2 feet wide, and 4 feet 9 inches high, with a circular head. In the height of the tower there are four small apertures for windows. There is a very convenient access up to the top, with steps and landings, and thus the traveller can with rare facility ascertain the full particulars of this fine erection of remote antiquity.

The last antiquities I visited in Ireland were those of Glandelough in the County of Wicklow, commonly called the Seven Churches. This is a term given also to other sites in Ireland, as to Clonmacnois on the Shannon, which has two round towers. Glandelough is one of the wildest possible spots, near a lake about two miles long, surrounded by granite and limestone ranges of mountains, and apparently shut out from the rest of the world. The cluster of churches would more appropriately be called seven chapels, for they vary from 30 to 40 or 50 feet long, and are altogether humble in their pretensions, yet still possessing much interest. S. Kevin is the peculiar saint of the spot, and his cathedral, as it is called, and the other edifices are constructed of rude masses of stone, roughly squared for the quoins and openings and interspersed with a species of lighter rubble construction. The doorways have a flat lintel, surmounted by a rough discharging arch, as shewn. Near the cathedral is a lofty round tower, without a roof. The masonry consists generally of average courses, 6 inches high, with some larger blocks irregular in form. At the bottom of the tower is a higher projecting course, answering for a plinth. The doorway is some 10 or 11 feet above the surface of the ground, about 2 feet wide, formed with large blocks of stone, with one of considerable dimension over the opening, hollowed out, so as to give a circular head to the aperture. The upper windows have a square head.

The most perfect and best preserved building of the group is the chapel or church, popularly called S. Kevin's Kitchen, on account of the small circular bell turret, which crowns the apex of the western gable, and is taken by the peasantry for a chimney. This turret has a conical roof and four square window openings immediately beneath. The roof is covered with slate stone, and is of a high pitch, having beneath it a vaulted ceiling, there being a chamber or hollow space between the two reported to be the sleeping place of the monks or priests. The construction is like that already described, but the lintel has a rude projecting slip on the face, as though it had been moulded. The joints of the string above it are rebated, evincing some care in the putting together of the rude construction.

Ere I close these imperfect notices, permit me to mention one of the richest specimens of domestic Gothic that I met with in my rambles. It is the door and window of an old house in

Galway, one of several rich memorials of bygone times, when Spain had considerable commercial relations with this port. Even the dress now worn by women of the lower class is peculiar, and consists of a black cloak and red petticoat, supposed to date from the Spanish period. The style of the sketch before you, with its three-centred arch, heavy hood mouldings, with the flowers, bespeak the style of the rich Spanish or Flemish art. But there is a peculiarity in the return of the hood moulding at the knee, above which rises a pyramidal weathering, found in other parts of Ireland and in the sketch of the doorway at Killmallock, which is also very peculiar.

In Ireland there are no edifices of the Mediæval period that can compare in extent with the first class edifices that we have in England; none that possess such a high standard of art, or such a variety, richness, and fulness of pure details. Some have been sadly treated in recent times, particularly S. Patrick's Cathedral, Dublin, which has been restored in a style disgraceful to its promoters. The late Mr. Cottingham has very successfully and ably carried out the restoration of Armagh Cathedral, and fitted up the interior in a manner conformable to English precedent in a very able manner. There are many Roman Catholic cathedrals of very large size being now erected and on point of completion, important as to extent and general disposition, but the details and style of which leave much to desire. The most successful modern edifice in Dublin, without doubt, is the addition made to Trinity College of the new museum by Sir Thos. Deane, Woodward, and Deane.

And now a few words on the scenery near Dublin. None on earth are more favored by nature than the inhabitants of Dublin. After the business cares of the day they may find within an hour, or at most two hours' ride or drive, their sea-side home at Kingstown, Bray, or along the coast to Wicklow, on rock or sandy shore. They may have their cottage or villa on the banks of the Dargle, or amid the sylvan solitudes of Powerscourt or Avondale;

"That vale in whose bosom the bright waters meet,"

and possess the richest scenery, and most lovely views of hill and dale, and fertile meads. Or if lovers of savage scenes, they may plunge into the rocky defiles of the Scalp, amid the chaotic mountain masses scattered in wild confusion; or may wander among the mountains, which encircle Glendalough, and in its wildest passes with countless legends of past centuries, and in the presence of its ruined structures, once held in deepest veneration, they may enjoy a romance, an abstraction and delight, which it would be difficult, if not impossible, to find near any other capital in the world.

Such are a few of the results of the spare hours of a three weeks' hurried tour in the sister isle; devoted mainly to more important and absorbing duties; but which found a relief, and in fact gained tone to the mind, by an occasional study of the beauties of nature, the romance, the history, and antiquities of old Ireland.

Mr. Gordon Hills, Associate, thought there was some foundation for the opinion that the room over the vaulted roof of St. Kevin's Chapel had been the dormitory of the monk (which was the firm belief of the peasantry); because there was a similar croft over the vaulted roof of the small chapel at Cashel, with a fireplace at the west end; the room, like the chapel itself, having a pointed arched roof. He agreed with Mr. Donaldson, that Cormac's chapel, Cashel, was of later date than the time of the particular Cormac to whom it was ascribed (908), and that it was, in fact, erected by another Cormac, who died in the year 1134. In the roof of St. Kevin's Chapel the stones were laid horizontally in parallel courses, with a stone covering over them. At Cashel the roof was very carefully constructed of a light tufa, with an outer coating of sandstone. St. Kevin's Chapel was only 25 feet long, and the width of the interior was about 18 feet.

Mr. Donaldson stated that some of these chapels were not more than 15 feet in length.

Mr. **Hills** said that the church of Glendalough was 75 feet, including the chancel, which was of later late. Its original length had been 50 feet.

The Chairman, Mr. **Ashpitel**, Fellow, observed that Mr. Hills had used the word "croft" in a sense which appeared to throw some light upon the meaning of the word "*undercroft*," applied in England to a crypt;—the vaulted space above being the "*croft*," and that below the church the "*undercroft*."

Mr. **Hills** said he had used the word as commonly applied by antiquaries in Ireland. A croft appeared to mean an elevated place,—as a small field lying in an elevated position.

In answer to an inquiry whether there was any external chimney or turret to the fire-place in the chapel at Cashel,

Mr. **Hills** said that none now remained. At Kells, however, there was a building of precisely the same construction, and from the marks remaining on it, there could be no doubt it had been inhabited. Dr. Petrie considered these chapels to have been oratories, and that the crofts were occupied by ecclesiastics.

The Chairman inquired if Mr. Hills had taken the contour of the mouldings. He believed the result of almost all archæological investigation shewed that the mouldings constituted the comparative anatomy of architecture, and that the character of a building could be judged by its mouldings, just as the structure of an animal was restored by Cuvier from a single bone.

Mr. **Hills** concurred. The varieties of mouldings were the very alphabet of the art. He had taken the sections of some of the mouldings of these Irish chapels, but had not any immediately at hand.

The Chairman asked if there were any cusps in the tracery of the windows. It appeared to him that the tracery presented all the elements of elaborate variety, without the cusping.

Mr. **Hills** said that the mouldings resembled those of the English Perpendicular period more than any other.

Mr. **Donaldson** observed that these buildings were constructed of the black marble of the country, which was difficult to work; and that economy had no doubt had great influence on the degree of ornament introduced.

Mr. **Hills** fully agreed in this opinion. Carving was consequently very rare in the smaller Irish churches. At Kilmacdure, however, in Galway, the decoration, which was Romanesque in style, was most admirably and richly wrought.

Mr. **Godwin**, Fellow, hoped the practical result would grow out of the present discussion, of increased attention being paid to the preservation of these interesting monuments. When he visited the Seven Churches, three or four years ago, he found they had been exceedingly ill-treated. There were many early grave-stones around them, with crosses and other decorations, for which very little care had been manifested; but he hoped the mention of this discussion in the Irish newspapers would show that the English public were alive to the merits of these relics of antiquity.

Mr. **Hansard**, Associate, adverted to the arrangement in some of the old buildings in Galway, in which a small lattice window was seen at the side of a large doorway; with other peculiarities evincing a Spanish origin; and asked whether there was anything in the character of the buildings to show that they were derived from Spain.

Mr. **Donaldson** said that the town of Galway presented many curious features worthy of study. The style was evidently a foreign importation, and very different from the Mediæval architecture of England. It resembled the Spanish, or, perhaps, more closely the Flemish style.

Mr. M. D. **Wyatt**, H.S., said it would be interesting if Mr. Donaldson or Mr. Hills could give any particulars as to the actual designers of these Irish churches. It appeared to him that these monuments might be divided into two classes. First, those he believed to have been erected from the native design which prevailed in comparative purity as late as 1200, and retained the characteristics of the style generally known as Celtic, with some affinity to the Scandinavian, but distinct from the Norman style displayed in Cormac's chapel. This chapel differed from that of Timahoe and other Irish structures, and was not in the style of the richly-decorated ancient crosses, in some of which was carved a prayer for the chieftain, and sometimes for the workman who made it—the names of both being unquestionably Irish. It was very desirable to know under what circumstances foreign elements of style had been introduced; and as Cormac's chapel was one of the earliest, it would be exceedingly interesting to know who designed this building for that chieftain. It appeared that there were two chieftains of that name in the locality; one of whom died in 908, and the other, according to Dr. Petrie, in 1134; so it was very possible that the chapel might have been built in the time of the second. It was evident, from dated documents and monuments, that, at the time thus assigned to Cormac's chapel, there were architects in Ireland capable of executing works quite equal in elaboration to anything which it displayed. That the same degree of skill was possessed at the same time by the workers in metal, was evident from remains in the Museum of the Royal Irish Academy. Nothing could be more refined or elegant than the decoration of those objects. Nevertheless, after about 1150, the Irish churches and other monuments, in their general features, as well as in their mouldings, appeared to resemble closely the English buildings of the same period. Allowance should be made for the introduction of the monastic system, which had become common to the whole of Europe, and it would be natural that the architecture of Ireland, from its vicinity to England, should partake of an English character. The question as to the actual designers of these works appeared to him to be the great *crux* in Irish architectural antiquities; any information on that head would therefore be very interesting and valuable.

Mr. GORDON HILLS was strongly of opinion, from the contour of the mouldings, that Cormac's chapel was the work of Irish architects. They were entirely different from English mouldings. The cathedral of St. Patrick, Cashel, was erected about 60 years after Cormac's chapel (about 1152), by De Montmorenci, one of the followers of Strongbow; and although it had some English, it also presented Irish features in the battlemented towers, and the peculiar gutter openings which had been referred to, shewing that Irish architects had been employed, and that their style had influenced that of the English workmen. In Kilmallock, founded in 1291, the mouldings, &c. were decidedly not English. The church at Adare, built about 1460, was also very Irish in its character. Upon the whole he was inclined to think that the architects of these buildings were natives of Ireland, and very little indebted to foreign interference. The church at Holy Cross was not like the Early English churches, but was quite peculiar in its style, and magnificently rich in its details. It had an elaborate vaulted roof to the chancel, with very beautiful small twisted columns; resembling in some respects those of Roslyn Abbey, Scotland, but more highly finished.

Mr. M. D. WYATT remarked that the principal features alluded to by Mr. Hills were mainly structural, and therefore gave little evidence of style. They arose from the necessities of the country; and it was not to them, but to minor details, in designing which the architect was free from such necessities, that they should look for evidence. He was inclined to think that after 1150 Irish architecture gradually changed from what it had previously been; and that different notions from those which had been at work before the invasion of Strongbow, then influenced the art of the country.

In reply to a question, Mr. HILLS explained that Cormac's chapel was anterior in date to the cathedral, which had been built against it, but on a different axis; and that the round-tower was older than the chapel.

The Chairman suggested that this variety of position might bear upon the question of orientation; a very interesting point, which, however, did not appear to have been observed in the sacred buildings of Rome and Jerusalem. With regard to the Castle attached to the Cathedral, and to the other Irish castles,—they did not appear to have any analogy with the English castles of the Norman period; but they rather resembled those of the Edwardian era. The large unoccupied space within the outer walls shewn in the plan of Portorra Castle, appeared to him to require explanation.

Mr. **Donaldson** said the round-towers at the four angles contained lodgings for the defenders, and also defended the side-walls of the large enclosed space which would receive cattle for protection at night. In case of a prolonged siege, temporary barracks were probably built as a "lean-to" against the walls of the court. These walls were only 5 or 6 feet high, and there were no visible evidence of any walls or buildings having occupied the area of the court. The internal diameter of the towers—10 feet 3 inches at the angles, only 15 feet externally—would nevertheless suffice for the accommodation of the forty or fifty men required to defend the place.

Mr. **Kerr**, Fellow, and Mr. M. **Digby Wyatt**, made some further remarks on the changes of style in the architecture of Ireland; the latter gentleman expressing his opinion that Cormac's chapel was of Norman origin, as shewn by the chevron moulding, the capitals, and other features of that style; and that the chieftain by whom it was erected had probably employed an architect who had worked either in Normandy or England.

Mr. **Kerr** suggested that the influence of the Church in Ireland might have been lessened after the decay of the first style, and revived in the twelfth century by the introduction of the monastic system from England, which would account for the diversities and foreign features seen in these early specimens of Irish architecture.

Mr. M. D. **Wyatt** agreed with Mr. Kerr to a certain extent; but the ancient Irish Church held different tenets from those of the ancient Roman Catholic Church, as was particularly shewn in the tonsure of the priests; which altogether differed from that of the Norman priests. The Irish were greatly emancipated from the usual dogmas of Rome. The Irish and English systems were altogether different. After the time of Strongbow an importation of Roman ecclesiastics took place, who brought with them the usages of the Church of Rome, and thence arose a rude imitation of English Gothic architecture. In different reigns of English sovereigns it was known that foreigners of various nations were predominant in matters of Art. Thus, in the reign of Henry III. the majority of ecclesiastics were Italians. In the reign of Henry II. there were an immense number of French ecclesiastics in England, and in each of these different periods the architecture partook of the masonic style of those respective nations.

The Chairman said that the difference in rule of the various monastic orders went far to explain the peculiarities of their different structures. The Benedictines lavished as much as they could on decoration, while the Ciscertians, on the contrary, repudiated all ornament. Buildings of the same age were therefore not to be ascribed to different periods in consequence of the presence or of the absence of decoration.

Mr. **Donaldson** observed, that as in England we had a number of interesting buildings which might be Saxon or Danish, but which he thought should be simply described as "*pre-Norman*," so in Ireland there was a style of great antiquity to which it was difficult to assign any fixed date. He hoped that the interesting discussion which his Paper had called forth would incite the natives of Ireland to examine more minutely their national antiquities, and do more justice to them than he had been able to do himself.

The vote of thanks having been carried, the Meeting adjourned.

ON PUBLIC COMPETITIONS FOR ARCHITECTURAL DESIGNS.

By George Morgan, Fellow.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, May 17, 1858.

In diverting the attention of the Institute and the profession to public competitions for architectural designs, I am actuated more by a desire to promote a calm consideration and discussion of this important subject at this opportune period, than by any confidence in my own powers to treat it with any novelty, or to grapple successfully with all, or any, of its difficulties and abuses. I am unwilling that the present session should glide by without an endeavour, on the part of the profession, to establish a system of public competition on a more satisfactory basis. Recent events have made vividly manifest the injustice, disappointment and loss which the present system entails on architects, and have enlisted such an amount of sympathy, on the part of the public and the press, as to render facile any well-directed attempt to reform it. I could have wished that some more able and experienced member of the Institute had resuscitated this subject, but I trust that any deficiencies on my part may be atoned for by the good that must result to art, the public and the profession, if, through my humble endeavour, architects will resolutely determine to settle the terms upon which they will enter into public competition. So grave a matter may well be approached by any one with great diffidence, when it is remembered that (in 1838), nearly twenty years ago, a committee was appointed by this Institute to consider my subject, who, having thoroughly investigated it, seemed appalled by its difficulties, and concluded by publishing a report containing much valuable information, but leaving the remedy very much where it was before, in the hands of the profession.

Save a most laudable attempt, in the year 1850, by the Architectural Association, and the publication of a report by that body, containing a code of regulations, no other combined movement has, I believe, been made to carry out the suggestions of the committee of 1838. From time to time, and recently with the greatest force, the Council of this Institute has urged upon the profession the recommendation of the committee of 1838, "that architects should meet together and lay down a set of regulations as to on what terms they ought to furnish designs in competitions." Our professional press have always endeavoured to arouse that section of our profession who treat the whole subject with apathy or indifference, to its importance, and to make manifest to the other the suicidal policy of rushing indiscriminately into public competition. To show the extent of public competition amongst us, and its application to the most trivial objects, I have searched, and find that during the last year, 1857 (a year of great depression generally, but especially in building matters), invitations were issued for sixty-nine public competitions for designs for buildings, representing, at a rough estimate, £300,000., the premiums ranging from 21s. to £200.; and in the majority of instances the conditions gave notice that the employment of the successful architect was very doubtful. It is impossible to form an accurate estimate of the cost of the preparation of the designs submitted in response, but most probably £30,000. would not be an excessive estimate representing the prime cost of the production of the designs and the professional value of the services in the carrying out of the buildings. Here, then, is an annual loss to the profession of £15,000., assuming the very doubtful proposition that the full commission of 5 per cent. is received by the successful competitors.

In reference to the general principle of competition, the conclusion is evident that it dates from and exists the moment that two or more individuals seek a common object. It is fostered by the aspirants, and springs from them: it therefore rests with them to determine the terms on which they will strive. It cannot be imagined for one instant that our profession can escape the action of this general principle, and, consequently, competitions amongst us must exist, and the terms of competition rest with ourselves. In what form can it exist most conducive to the advancement of art, the progress of science, and the welfare of the public and the profession? If competition is to be only that of interest, or canvassing for commissions, how degrading is the position of the architect; and in such a strife the most talented artist has probably the least chance.

If competition is to be select or limited, it must partake also, in some measure, of favouritism, canvassing, &c., and the advance of our art will be proportionately impeded. A competition of merit can alone exist amongst artists, if any regard be paid to the prosperity of art. Employment ought not to be sought, it ought to be commanded by artists. Public competition, then, appears in principle to be the system most likely to produce the desired objects. To substantiate this conclusion, I will not cite the many admirable buildings that competition, with all its corruption, has given us, for I admit that the name is legion of those buildings diametrically the reverse in character, and yet the offspring of the same system. But I endeavour to substantiate it by the increased study and knowledge of architecture, and by its progress as a fine art amongst architects during the term that public competition, in its abused form, has increased amongst us. I attribute the revival of Gothic and Italian architecture, and the rapidity of the progress of such revival, mainly to public competition. I attribute the establishment of the Architectural Exhibition to public competition. I attribute the accession of many noted names as architects, and the great increase in the number of members and importance of the profession, to public competition. I attribute a great diffusion of architectural knowledge amongst the people to public competition; and, perhaps, progress in art depends more upon the state of education of the public than upon that of the professors themselves. If the client be an artist, the architect cannot fail to be so.

Let me first consider the evils which are inseparable from public competition for designs in art. A proposal for public competition may be divided into four sections;—the instructions, the terms, the regulations, and the award. It is obvious that the public must draw the instructions and make the award: it ought to be equally clear that the artists should settle the terms of remuneration and the regulations amongst themselves, so that each competition design is equitably represented, and that the successful artists be not deprived of their reward. Now, the evils which are inseparable from all art competitions, are as to the instructions,—

The imperfection or vagueness of instructions.

The want of direct communication and consultation between artist and the client.

As to the award,—

Injustice on account of incompetency or fickleness of the judges.

The above evils are inseparable from competition, mainly, from the ignorance of the public on all matters connected with art, but almost hopelessly irremediable as regards our profession. A general knowledge of painting or sculpture is much more easily attained than of architecture; and yet no one would pretend to act, in a competition of painters or sculptors, without some pretensions or qualifications of fitness for the office. There are many highly-educated amateurs, competent to decide on the merits of a work of art in painting or sculpture. But in respect to our neglected art, how different is the case! The public invite architectural designs, and adjudicate upon them without the slightest capability for so important a duty or knowledge of the subject. The unavoidable evils to which I have alluded are therefore magnified, and, in an increased degree, beset architectural competition.

The evils to which our profession are more subject in competition are the endless waste of thought, energy, and time, and loss which are suffered by the unsuccessful competitors. Public competition seldom calls on the energies and pocket of the painter and sculptor, and the fruits of their labours are never entirely lost. The painter's cartoon or the sculptor's model, although unsuccessful in competition, may secure him patrons and clients, and if vivified by genius, will certainly command a reward on the consummation of the work. Again, the painter or sculptor can enter into competition without any study foreign to his art or preparatory loss of time. How different is the lot of the unsuccessful architect! He has to study instructions, incur journeys, and collect his materials, before he can enter into competition. Let me take an example from the late competition for barracks. His first labour was to master the contents of the elaborate report. This entailed an inquiry into the construction of a battalion, the manners and habits of soldiers, sergeants, officers, and all the minutiæ of military life. If he competed for the cavalry barracks he had to study stables, riding-schools, forges, &c., granaries, hay-lofts, and all matters relating to troop horses. He had to incur outlay in travelling to inspect barracks in various parts of the kingdom, and he had to turn his attention to barrack-rooms, canteens, libraries, schools, hospital, orderly-rooms, guard-rooms, ablution-rooms, bakery, provost prison, powder magazine, wash-houses and drying-rooms; to ventilation, warming, supply of water, cooking apparatus, and engineering details, under special circumstances; formation of parade grounds, racket courts, &c. &c. &c., and numerous other matters to which perhaps he may never turn his attention again, with but small opportunity for the only study from which he could derive any permanent benefit as an artist, that of the fine art of his profession.

It is really lamentable to consider the waste of time, thought and money expended on this almost gigantic task without any profitable result. It is evident that, in the majority of competitions, the position of the unsuccessful architect assimilates in a greater or less degree to that in my example. His progress as an artist is impeded by unprofitable pursuits and by the vast ramifications of the studies into which he must enter. In contrast to him his brother artists, the painter and sculptor, even in competition, are perfecting themselves in their arts, and expending their time and energy to some profitable result. I can hardly consider but that, if the public be made fully aware of the unrequited labour which the profession bestow on the preparation of designs for public competition, that even the successful are never fully repaid, many of the abuses which now encompass the system will be cheerfully remedied. The most prominent of these abuses are its too general application, its application to favouritism, or for mere commercial purposes; and, again, when there is no positive intention to erect the building for which the competition is invited. To revert to my subdivision of the component parts of a proposal to compete:—

1. I may classify among some of the abuses of the "Instructions,"

I. The avoiding of any definite instructions.

II. The naming of an estimated sum for which it is impossible to complete the building with all its requirements.

III. The suggesting of requirements which are not really wanted, and which often lead astray the competitors. Instance,—the Government Offices competition, and the schemes which were submitted through the allusion to the communications of the metropolis.

2. The abuses of the terms are:—

I. Offering inadequate remuneration.

II. The hollow speciousness with which they are often drawn, to excite the too willing belief of the aspirant that the only real prize for which an architect competes—that of the carrying out of his design—shall be awarded to him, if he be successful. Ostensibly the terms promise this, but they are encumbered with provisoes,—"if his character be unexceptionable"—"if he be competent"—"all things being equal"—"he shall have the preference," &c. &c., which the too credulous competitor never thinks can apply to him.

III. Architects under the present system being always ready to respond to any terms: however absurd, we have public bodies, through their clerk (generally a solicitor), drawing terms more and more onerous, introducing some additional hardship on the profession, and reducing the remuneration on every fresh appeal.

IV. A competition of terms. In two or three instances lately, the competition has been simply one of terms. I may notice the memorable one of Bolton Workhouse, in order to ask the Institute if the majority of these men are to be considered architects by the public, or will the Institute take some steps to point out the difference.

3. The abuses of the regulations, I think, rest principally with the profession. They may be enumerated:—

I. Wilful attempts to gain advantage by exceeding or departing from the regulations.

II. False perspective drawings.

III. Inaccurate estimates.

IV. The discovery to the judges of the ownership of drawings when a competition is under consideration.

V. Canvassing the judges.

4. The abuses of the award are—

I. The ignoring of their own instructions by the judges.

II. An unjust award, either through favouritism or from a determination to adjudicate, to escape from the difficulties which the unfortunate judges have at last discovered.

III. The selection of designs without testing the estimates or representations of competitors.

IV. An award solely on commercial grounds, as if the designs were mere tenders.

V. The adjudicating secretly or politically.

VI. The want of any remedy to architects.

It is not necessary for me to occupy the time of this meeting by citing examples in detail to prove the abuses which I have enumerated. All of us know practically that these, and many other abuses which I have failed to specify, exist, and that there is no probability of their diminution, but that they will rather increase and multiply unless the profession make some effort to remedy them. But the greatest of all abuses, and one which I cannot pass by without some further remark, is the most prevalent and rather recent abuse of the depriving the successful architect of the fruit of his exertions—the realization of his design. I have endeavoured to sketch the position of the unsuccessful architect; but the position of a successful architect deprived of his reward is a disgrace to the profession.

Many have experienced the bitter lessons of disappointment, but still have struggled on, time after time, with the same heartsick result, and only buoyed up with the hope of ultimate success. It is absolutely shameful that any system should exist which, through the apathy of his profession, deprives an artist, successful after such a struggle, of his just and hard-earned reward. That this system does exist, even amongst the guardian patrons of art, let me trace the history of the late Government offices competition. Suddenly we heard rumours of a grand scheme in contemplation by the Government for the concentration of all the widely spread offices of the various executive departments. We watched with interest the proceedings. We read attentively the minutes of evidence taken before a Parliamentary Committee summoned to consider it, and rejoice at the unanimity of their report, in favour of the scheme. The First Commissioner of Works sought the counsel of the profession, and discussed with the members of this Institute the terms of a public competition for designs. Amongst others, a question was put as to the intention of Government in regard to employment of the successful architect, and was answered in the usually reserved official manner. But I quote the *Builder*, April 20th, 1856:—"Although no pledge would be given, it was understood that the successful competitors, if competent, would be employed to carry out their designs, and would receive the usual commission of 5 per cent."

As soon as the advertisement of the invitation appeared, many of us, if not all the profession, applied for copies, and we read—

"Office of Works, Whitehall, London,
"30th September, 1856.

The Commissioners of Her Majesty's Works and Public Buildings, give notice that they are prepared to receive three designs from architects of all countries; the first to comprise a scheme for the concentration of the principal Government offices on a site lying between Whitehall and the New Palace at Westminster; the other two designs for buildings which Her Majesty's Government have determined to erect forthwith as parts of such scheme—one for the Department of the Secretary of State for Foreign Affairs, and the other for the Secretary of State for War.

"If the architect to whom a premium may be awarded in respect of designs No. II. and III. or either of them, shall be employed to superintend the execution of the work, he will not be entitled to receive such premium, but he will be paid a commission, at the rate of five per cent. upon the outlay. Such commission to include all expenses for measuring, superintendence, &c., except the salaries to clerks of works."

The above particulars were forwarded to all the European embassies without one word of comment. Many of us responded to this invitation, and all of us are intimately acquainted with the proceedings down to the final award. Now, if the profession had been only true to itself, could there have been any doubt of the result, that the successful competitors would reap their reward? It is with regret we are compelled to admit that there has been an attempt to deprive them of it. Now, I am not going to prejudge the result of this case of public competition; I fervently hope that justice will be done to the successful competitors, and through them to the profession. I think that the case of the successful competitors is much stronger than it has yet been put before the Government, and I urge upon the profession to use every endeavour to obtain justice. This case appears to me the fittest for consideration upon the present occasion, as it exemplifies the interpretation by the highest public authority of the present system of public competition. By analysing this, in order to suggest, or arrive at, a remedy, I give the public the benefit of the most liberal interpretation of the view which is taken by them of their part of the contract, involved in public competition.

On first sight, the invitation to architects to compete for the new Government offices seems all that could be desired. We have instructions explicit and complete; terms ostensibly fair and consonant with the views of the profession; regulations drawn almost in accordance with the code prepared by the committee of the Architectural Association; and an award by irreproachable judges, assisted by professional assessors. Why, then, should there be any doubt about the result? Because we, the profession, tacitly assent to a limited responsibility on the part of the public. This is the crying evil in public competition. In private practice we are protected by the law of custom; in public competition we abrogate the law by our own acts in competing on whatever terms the public dictate, trusting to the moral effect of custom upon the public. It will never be maintained that any member of the profession competes for the mere small money premium; then why permit the public to think that we do? Why do we respond to invitation after invitation, and accept the shadow for the substance in competition after competition without a murmur or complaint? What can be the result but what it is; and that when the Institute memorializes Lord John Manners on the Government competitions, the First Commissioner being ready with a precedent, it is implied that if the Government do not employ the successful competitors to erect the Government offices, they are not acting in any way contrary to custom or at variance with justice?

If we only enter into competition for the prize of executing our design, why do we not as honourable men state boldly and unreservedly that the first prize in any competition must, in the usual professional terms, be the professional employment?

There must be no proviso of competency, or age, or character on the part of the successful candidate. If the public resort to public competition they must share some of the evils with the profession, and not cast all the burden on the shoulders of those least able to bear it. We must fix upon them the responsibility of proper instructions, the voting a sufficient sum for the required accommodation, a thorough examination and publication of the designs, and the most just award in their power. We must make them aware of the responsibility that rests with them in every step of their progress, and urge them to seek the assistance of professional men, both in the preparation of their instructions, and in making their award. I consider they must be bound to make an award under any circumstances; for in ninety-nine cases out of a hundred, the excess of the cost of a design over the estimate rests with the public, as they stipulate for the requirements, and gratify their taste in the selection. If the public are wrong, why should the author of the selected design be only punished? It appears to me, then, that the great experiment of the Government offices competition fails (and all systems may be said to fail when there can be a doubt as to the results) solely from the limited responsibility assumed by Government. From this cause we have instructions hastily conceived and calculated to mislead the competitors, as they aimed at concentration, and we have an award evidently defeating the main object of the competition, the concentration of the Government offices. If Government did not interpret their invitation that they might put the profession to the expenditure of £ 25,000, awaken the rivalry of the whole profession, and deprive the successful competitors of their real reward at an outlay of £ 5,000, we should not have had instructions to aim at concentration, and an award of prizes to those who had simply contented themselves with designing separate buildings. Simply, then, the reform of the abuses of the instructions and award, as far as they can be reformed, except by the progress of art, rests with the profession, by increasing the responsibility of the public, and thus enforcing parties inviting designs in competition to first mature their own plans. No objection can well be taken to the terms in the Goverment offices competition, except that the first prizes should have been the *unconditional* professional employment on the usual professional terms. In respect to the regulations, it should have been stipulated that the perspective views should have been all taken from one point. I am also strongly of opinion that the practice of submitting designs under motto should be abandoned. It is no preventive against favouritism, or an unjust decision; in fact, it will be found to foster these abuses. It also tends to lower the character of competitors, induces the submission of many absurd and ill-considered designs, and enables adventurers to compete by hiring the talent of others. The exhibitions of designs before and after the award should also be a condition insisted upon by architects.

Let me now urge upon the Institute the consideration of this most important subject. On what principle are the members honourably bound to one another to pursue private practice upon the usual professional terms, and yet are unfettered and left to their discretion as to their professional conduct in public competition. Why should an abandoned design prepared privately for a £3,000 building be worth £75, but if prepared for public competition be worth say £20? This is practically the result of non-interference with competition. It is incomprehensible to the public; and, as architects are too willing to compete for the smaller sum, so, when in private practice, they require their just remuneration, it is too often considered an excessive demand. If it be necessary to regulate the private practice for the good of all, how much more necessary to regulate public conduct! I call upon the Council as one of its members to legislate on this subject. Let me beg you to take a lesson from the committee of 1838, and avoid delay. The evils and abuses that existed then were made fully manifest to the Institute, but it was simply content with suggesting remedies. The result of this course is, that in twenty years, such abuses and evils have been neither decreased nor remedied, but have been increased. In the meantime, the number of architects in practice in London has increased from a little more than 200 to nearly 650. Another year will only add to the difficulties of legislature. If this body cannot suggest and carry out a remedy, no other professional institution can; and all the other professional societies are eager for the reform of the present system. Any remedy must emanate from the Institute. In rank, influence, and number of its members, it has no rival. For want of legislation on this subject and a unity of practice, we have seen Sir C. Barry worried and annoyed as to his remuneration while carrying out his great design; we have a hesitation upon the part of Government to carry out their pledges in the Government offices competition; we have all kinds of theories propounded as to our professional remuneration; we have public competition resorted to on the most flimsy pretexts; we have public competition avoided by the most talented members of our profession; we have the young artist's career impeded, if not arrested, by disappointed success; and we have public competition unsatisfactory in its results to the public and the profession. To the Council, I have only to urge that it is your bounden duty to take the control of the conduct of its members in public competition, and endeavour to improve the present system. I am satisfied all the members will heartily assist and co-operate in this work: the season is most fitting, and delay will only aggravate the evil. It would be presumption on my part to dictate to the Council or the Institute the course to be pursued. I have endeavoured to touch upon most of the points connected with public competition, in order that they should be calmly discussed, but the principle upon which I would wish to insist is that as public competitions for architectural designs entail a certain loss upon the unsuccessful competitors, it is only a matter of common justice that the successful competitor should have the reward for which he competes, without any reservation whatever, and that architects should resolve to submit designs on no other terms. If architects will resolutely adopt this principle, if the motto system be adandoned, if public exhibition of the designs before and after adjudication be insisted upon, I have great faith that many of the abuses which now beset public competition for architectural designs would be ameliorated. I have essayed to show that it is the abuse and not the use of public competition that has entailed most of the evils which beset the present system; that public competition is advantageous to art, the public, and profession; that any reform must emanate from architects, as they have the control of the terms and regulations; and that the most practical step towards improvement is only the extension by general resolution of the same honourable code of regulations to public competition which exists among all members of the Institute as to their private practice. I feel confident that the public on their part require only to be made fully aware of the duties and responsibilities which they undertake in inviting competition, and it rests with the Institute to enlighten their ignorance, and remove those false impressions which, unhappily, are now so prevalent, and have become so widely disseminated, that even the Government, the guardians and patrons of art, blindly hesitate between justice and injustice.

Mr. Papworth, Fellow, said the question raised by Mr. Morgan required the calmest and most careful consideration; but in asking the Council or the Institute to put the whole matter right, he was calling upon some 200 out of 1800 or 2000 members of the profession to do what should be done by all. The 200 constituting the Institute represented a large majority of the talent of the country; but even if they were to arrange among themselves certain conditions without which they would not compete, how could any possible movement be made to bear upon the boards or committees throughout the country, to induce them to accept those conditions? He saw no way of attaining the object without an entire alteration of the law of the land. Supposing their most utopian views of unanimity were realised in the acceptance of a code by the whole profession, it could not be forced upon employers, and there were, moreover, engineers and builders who, not being bound by the accepted code, would still supply designs prepared by the aid of purchased assistance. Committees would still have competitions on their own terms, and exhibit specious and showy drawings as the result of fair competition. The great injustice of the present system had long been felt; but was there any other profession in which a similar complaint was not made,—especially in competitions for prize essays? He submitted to Mr. Morgan whether, instead of calling the attention of the profession to the present state of things, which they all well knew, it would not be better to lay before them some plan of improvement which they might discuss, so as to arrive at some understanding. If a law could be made binding committees to observe certain conditions, he believed some improvement might ensue.

Mr. Kerr, Fellow, said the meeting was very much indebted to Mr. Morgan for the practical business-like way in which he had taken up the matter. He (Mr. Kerr) proposed to consider it as a commercial question. The subject did not require any research into antiquity, or much reference to analogical reasoning. Competition in the nineteenth century was really a very childish thing in its results, and might be illustrated by putting a childish case. Suppose A., a little boy at school, had a capital of sixpence, which he proposed to invest in buns. He caused it to be intimated to B., C., D., and all the other boys, that they might send in samples in the form of one bun each, and having received them, he proceeded to adjudicate by eating them all up; and having come to the conclusion as to which was the best, he invested his sixpence with the successful competitor. Each competitor, not knowing much of mathematics, reasoned thus,—"If I get the order I shall make a profit on the whole, though I shall lose what I have sent in; but that is only the loss of the material." The result, however, was only obtained at an expence to all the others. Here was a want of commercial principle in the beginning of the transaction; and instead of 2 and 2 making 4, it would, in fact, make something very different. To put another case,—A party, client, wishing to erect a building, employed an architect, and paid him the market value for a design,—say at the rate of one per cent. upon the outlay. He was, however, afterwards advised to resort to competition, because he was not sure that an individual would give him the best design he could have, whereas, with three or four designs he would have so many chances of getting the best. This was, so far, a correct commercial principle; but that which would be payment for a single design would not be payment for a choice of designs. When he was learning the "business," out of the reach of modern improvements, a banking-house was to be built in the town. There were only two architects in the place, but Mr. Rhind, of Edinburgh, was selected as a third; and this primitive banking company paid each gentleman 100 guineas for his design, and carried out that which they thought best. This, he considered, was overdoing it. As a principle the value of a design was partly to be estimated by the value of the labour involved in it, and partly by its applicability to the required purpose; and if one per cent. represented the market value of a design, it might be assumed that one half of that would represent the labour and the other half the merit. If five designs were employed, the best design would be represented by a whole value, or one per cent., and the other four by a half per cent. each; the value of the choice of the five designs being three full per centages; and where there were ten or twenty designs the proportion of value to the number of competitors would decrease, though the absolute amount involved in the payment would increase. Another principle to be remembered, was that beginners and junior members of the profession would always be willing to enter into competition on less remunerative terms, and indeed for the mere chance of success. This was a perfectly sound commercial principle, and was indeed the foundation of public competition, but then it became difficult to calculate the value of the choice. The client could not be bound to incur an unlimited expence, even upon the system of calculation which he (Mr. Kerr) had laid down. It was true that where there were a great many competitors of low rank those of a higher would not compete, and this would make up part of the difference of value. If the order of merit were given, and if allowance were made for the inferior standing of the competition, a commercial balance would be established, and it would be found that the value of choice would not be much more than where only five or six designs were submitted. Supposing then, that a competition was opened upon a correct basis, the next great question would be its adjudication; and, as an Englishman, the employer would insist on having the selection himself, and maintain that his doing so was a commercial principle. On the contrary, here was the beginning of unsoundness. If Client was competent to select the best design, he was equally able to do without designs at all. If not, his only correct course would be to go to different designers, and pay each of them. In a competition the adjudication must be according to the standard upon which the designs were made. The judge must be an architect, for an architect only could properly judge of an architectural design. Not all the committees in the world could persuade him that they possessed anything like the knowledge which enabled an architect to decide in any architectural competition; and the calling in an architect was alike for the benefit of the competitors and the client. He was disposed to lay very great stress upon the order of merit in a public competition, and he thought it a pity that the order of merit of the designs for the Government offices had not been published. The profession entered into that competition not for any money consideration, but for acquiring a certain amount of distinction; which had been denied them by the omission to publish the order of merit. This might be done even now, from the notes of Messrs. Angell, Pownall, and Burn. In the case of the Liverpool Museum, sketches only instead of finished designs were called for. Sixteen sketches were sent in, but the experiment failed, from the fact that a large proportion of the selected architects belonged to Liverpool. The Liverpool people had indeed a strong affection for their own townsmen, and that amiable feeling,—rather too commercial in its nature,—might have slightly influenced their decision. He would now suggest a plan of his own. Instead of advertising for designs, he would advertise for candidates; and supposing there were a hundred candidates or two, let them each state their qualifications, and the ultimate cost of the design, and let a proper architect be called in to decide. In no case where an architect had adjudicated had the award ever been pronounced corrupt.

Mr. MORGAN—The Post-office, the Royal Exchange, Brixton Church.

Mr. KERR said he was speaking of recent times. They had, perhaps, improved since the days of the Post-office and the Exchange. Mr. Godwin, Mr. Barry, and Mr. Hardwick had assisted committees in this way, and they had not the slightest difficulty in at once reducing a public competition to a select competition between some half-a-dozen or a dozen designs. If competitions were reduced in that way, and if the instructions to competitors were drawn up properly, and fully (for nothing could be a greater mistake than withholding information), the result might possibly be more satisfactory than at present.

Mr. Fraser, C. V., read some remarks on competitions, from the preface to the catalogue of the designs for the New Houses of Parliament (1836); and urged the great importance of entrusting the adjudication in all cases to none but properly qualified persons. Every one of the judges, in the case of the Houses of Parliament, more or less acknowledged their inability to do what they had done; they deprecated the difficulties they had to encounter, and their incompetency for the task, and whilst they were instructed to recommend the best *five* designs they only selected *four*.

Mr. Jennings, Fellow, was opposed to the principle of competition altogether. They never were, and from the nature of them they never could be fair. It too often happened that a competitor sent in a design because he knew one of the judges, and could express his ideas, and talk over with him all the requirements of the case, and the judge in return patronized the plan. The judges as a body were generally incompetent, and were ruled by one or two of their number, who were interested in the success of individual candidates. He had himself often been asked to compete,—"because you know Mr. So-and-so, who is an active man, and you can learn what his ideas are." This however, he had always resisted on principle. He was aware that many young men had no opportunity of showing what they could do, except in competitions, but if they could add their names to their designs openly, the advantage would be much greater both to themselves and the public. They would do better still by exhibiting their designs without any competition. He thought the least objectionable mode of selecting designs for premiums would be to allow the candidates themselves each to select two designs, as they necessarily knew more of the subject than the judges. It was very desirable that the drawings should be exhibited after the award was made, with the names of the authors upon them; for although it was said that an architect who had failed would not wish his name to be known, he thought most persons were so well satisfied with their own designs that they would not object to their being exhibited.

Mr. Hussey, V. P., agreed that the competitors were best qualified to adjudicate, and that there could be no collusion among them. He had no hope, however, that this plan would ever be carried out, as it would appear to be a confession by the judges of their own incompetency, and a delegation of their authority to inferior parties. There would be a further advantage, that the competitors would award with strict reference to the actual instructions issued, and not according to the peculiar wants of the employers. They would thus hit any faults in the instructions, and competition would be conducted on a better system, and based upon more accurate instructions.

Mr. M. D. Wyatt, H. S., said he could not agree with Mr. Morgan, in ascribing the revival of Mediæval art to the result of competition. To a certain extent it had, no doubt, increased the facility of drawing, more particularly in relation to metal design. That competition had vastly increased the numbers of the profession, there could be no doubt; but it might be questioned whether this was a benefit or not. In competitions generally, there was no previous test of character or ability; and following out the principle of justice, it would be right to saddle the onus of any disputable candidate upon the party inviting the competition. The great error was in looking at competition designs as finished works, whereas they were truthful only as educational tests. The employers in effect said to the candidates, "each of you do this, and let me see who does it best." But if he were to say, "now all go hence, and, when you return, bring me a paper on logic," would there be any certainty whatever that the result represented the ability of the candidates? To have a competition properly carried out, the thing should be done without assistance, under the eye of the employer, as at the universities. Great complaints were made with respect to defining the conditions of a competition. To do this properly was in fact to make the design, and on the present plan the architect was put in a false position. Instead of being consulted at the beginning, he was only called in after the part in which he could be most useful, and which indeed he ought to be the only person to determine, had been determined upon. This was entirely wrong. He thought if architects would more generally abstain from competitions, and exercise more self-denial, the respectable and clever architects would soon have their talents appreciated; they would be called in earlier, and would come to be looked upon as advisers and not merely as executors. He agreed with Mr. Papworth in the hopelessness of anything proceeding from the Institute being made to bear upon the whole of the profession; but that did not absolve them from making a protest in the right direction. He did not agree with Mr. Kerr, that competition for excellence was a commercial principle. Competition for price (as for any quantity of wool or cotton) was so, but not competition for excellence. He admired Mr. Kerr's illustration, but so far from spending the sixpence after tasting all the buns, he found that was seldom the case in actual competitions.

Mr. **Hansard**, Associate, drew attention to the proviso in the last clause of the instructions for the Government Offices, to the effect that "*if* the successful candidate should be employed," the premium would be deducted from his commission; and the Government no doubt sheltered themselves under this very unfortunate "*if*." He thought it desirable that some few words of approval should proceed from the Institute in reference to the course pursued by Sir Benjamin Hall, who spoke up manfully for the profession, but was thwarted in every way by the Government then in power, who were determined not to employ the successful architect. With regard to competitions generally, he had adopted the advice of the Council of the Institute, by first writing to the parties for particulars. Sometimes he had no reply, and when he had, the most important answers were almost always omitted.

The Chairman, Mr. Ashton, V.P., referred to the Greek mode, mentioned by Mr. Fraser, of deciding competitions by giving to each candidate two votes,—one of which he would give for himself, and the other to the next deserving person. That mode of decision had been recommended at the time of the competition for the Houses of Parliament, but had it been adopted on that occasion, he (Mr. Ashton) did not think it would have led to the selection of Mr. Barry's design, as after the decision a very numerously attended meeting of the unsuccessful candidates was held at the Thatched House Tavern, in order to vote petitions to both Houses of Parliament against the adoption of them. The preliminary conditions of all competitions ought to be defined with the greatest nicety, and not by any one who was not competent to make a design himself. The present system, therefore, began at the wrong end. For example, both for the Houses of Parliament and the Government Offices, the Government in the first instance fixed upon the site. Without consulting any body of architects the Government decided to place the former on the Thames mud, and the fault of site had never been got over; whilst an enormous expense had been incurred in perpetually building up one structure higher than another, to raise it from the mud on which it was so completely sunk. The Government Offices, in like manner, were to be built upon a site quite incompatible with a good arrangement of the block plan.

Mr. **Hesketh**, Fellow, thought it would be very desirable that Mr. Morgan's suggestion with reference to the Council of the Institute taking the matter up should be adopted, and that some advantage might result if they were to consider the matter fully and to offer certain suggestions in the form of a simple set of rules merely to those committees and boards who were willing to act honestly, because much of the injury of the system of competition arose from a want of knowledge in the parties inviting them. These rules should prescribe the manner in which the drawings should be tinted or finished, and should exclude any over exhibition of figures in the perspective views, and at the same time enforce uniformity of scale and other important details.

Mr. Kerr had no doubt that the Architectural Association, which had given some consideration to the subject, would adopt anything which the Institute might recommend.

Mr. M. D. Wyatt said he had omitted to point out, as one of the most injurious effects of competition, the very early period at which it took a young man from his studies. He had himself been applied to for employment by young men who had gained premiums in local competitions, but whose abilities were very limited; and in one case he found that a salary of a pound a week was the most which the services as a temporary assistant were worth. It was evident that this young man required four or five years hard work before he should have competed; but if he had been able to employ a better draughtsman than himself he might have shown a better drawing. He thought the effect of the temptation held out by these competitions, in stopping that course of education which could alone lead to eminence, was one of the most serious evils. Every architect knew that it was only after ten or twenty years of serious work that he began to know his business well, and it was extremely dangerous to have his attention diverted from study in early life.

Mr. Morgan said he should be perfectly satisfied with the result of his paper if it were referred to the Council. He looked upon competition as unavoidable, and he looked upon the present state of architecture as mainly owing to it. Sir Charles Barry's Church at Brighton—his Traveller's Club—Manchester Athenæum—and other great works, were all the result of competition.

Mr. M. D. Wyatt observed that the late Mr. Pugin never entered into a competition, yet it was impossible to ascribe the present state of Gothic architecture to any person more than to him.

Mr. Morgan admitted this, but stated that Pugin had imitators who did compete, and through whom his system became more widely spread.

The vote of thanks to Mr. Morgan having been carried, the meeting adjourned.

THE TWELVE OBE

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ON THE EGYPTIAN OBELISKS IN ROME AND MONOLITHS AS ORNAMENTS OF GREAT CITIES.

By the Rev. Richard Burgess, B.D. Honorary Member.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, May 31st, 1858.

I intend the latter part of the title I have given to this Paper to stir up a question rather than settle a point; the question to be agitated is, are monoliths suitable as ornaments of our metropolis? Have they not something more severe, sublime, and erect, than a mass of masonry reared in air, or an equestrian statue mounted on the attic of an ornamental gateway? The inscription "graven with an iron pen and lead on the rock" was the most ancient as it was the most durable of monuments, and our Druidical ancestors have at least shown us that if we want a memorial to be lasting, we should lift up in air a mass of stone, and it will tell its story to a hundred generations. The monument which the builders on the Plains of Shinar intended to erect of brick and slime was a failure. The stone which a Patriarch reared with the help of his servant was said, many centuries after, to have remained "until this day." It is remarkable in our day of mechanical power, that we should shrink from undertaking what the ancient men of Egypt seem to have found so easy. Herodotus tells us of the Monolith Temple of Latona, which from its dimensions must have weighed 5000 tons, being removed from nearly one end of Egypt to the other, a distance of 600 miles. And yet the largest mass moved in modern times (carried only a few miles with prodigious labour) I mean the solid mass of stone which supports the statue of Peter the Great at St. Petersburgh, weighed only 1200 tons. The French found no small difficulty in transporting the Obelisk from Luxor, and all the power and might of England shrink from the attempt to get up and bring home Cleopatra's Needle. There are now lying in the quarries of Egypt two half cut obelisks which might be easily obtained; another at Hieropolis that might be had; and if the experiment were tried, I doubt not that we could get obelisks of near 100 feet high out of our own quarries in Cornwall or in Aberdeenshire. But I cannot expect to carry this Institute with me in this suggestion unless I can succeed in commending to it the obelisk as an object interesting in itself, and magnificent as an ornament. I fall back, therefore, upon the first clause of my title, on the Egyptian obelisks in Rome.

After the battle of Actium, which put Octavianus into possession of the Roman world, Egypt was reduced into the form of a province, and its monuments (of great antiquity) lay at the disposal of the Emperors. Augustus immediately began to remove Obelisks to Rome, and his example was followed by his successors down to Constantius. During that period of 340 years, those Imperial Expeditioners had managed to import 48 of those monoliths, which were all set up in Rome, and found standing in the time of Valentinian and Valens, A.D. 364. In the regionary or catalogue of public buildings made at the time by Publius Victor, we read, "Obelisks (great) VI. viz. two in the Circus Maximus, the greater of which is 132 feet, the less 88½ feet; one in the Vatican 82 feet; one in the Campus Martius 72 feet; two at the Mausoleum of Augustus 42½ feet each. Obelisks (small) 42. Upon most of them are Egyptian characters." It is rather a remarkable fact, and shows the enduring monumental power of a Monolith, that all the six great obelisks have survived the ravages of "the Goth, the Christian, Time, War, Flood, and Fire," and are still erect by transposition, continuing to be the most expressive and striking ornaments of the City of the Popes. Of the smaller ones six only remain above ground, these are not all like the six large ones of genuine Pharaonic manufacture, but some of them of modern date, that is, they were made in Egypt for the Roman Emperors, and transported at an enormous expense from the banks of the Nile to the Tiber. Besides the 12 that now stand erect in Rome, two are known to exist under the earth, especially one under the Church of the Jesuits of a large size, and there is one at Florence; but there are still more than thirty to be accounted for, which may probably yet be dug out of the ruins of ancient Rome. It is not, however, my purpose to make any underground speculations, but to endeavour to illustrate, as well as a little smattering of Egyptian learning may enable me, the twelve obelisks now existing at Rome.

In the original places where those monoliths stood they had a use; where they stand now in a foreign city, they are mere ornaments. They were placed in Egypt generally in pairs at the entrances of large temples, palaces, or royal sepulchres, that they might indicate to posterity by their monumental characters, the meaning of the edifice and the name of the king who had caused it to be erected. They served the same purpose as our epitaphs and inscriptions on less splendid monuments; so that when removed from their original site they of course lose much of their meaning. The ancient Romans, however, did employ them to some purpose, they set them up on the Spina of the Circus, they placed two in front of the Mausoleum of Augustus, and they made use of one in the Campus Martius as the gnomon of a monster sun dial. The name now used for these monoliths is rather ignoble in its origin: οβελος is Greek for a spit, and obeliscus is the diminutive; the form may probably have suggested the word to the Greeks, but the Egyptians had the thing itself in use, for Diodorus Siculus in describing an Egyptian dinner mentions cauldrons and obelisks in which and on which immense joints of meat were cooked. It must, however, be confessed that the obeliscus or little spit is of a most graceful form, it is a monolith, as everybody knows, of four equal sides, gradually tapering from the base and ending in a pyramidion, which is longer or shorter in proportion to the shaft: it was a more poetical idea that likened it to a ray of the sun; "radium imitetur gracilescens," is the elegant expression of Ammianus Marcellinus; its material was the warm red granite taken from the quarries of Syene in Upper Egypt, termed "Syenite" by mineralogists, which differs from our common granite in this, that it contains as the third constituent part, hornblende instead of mica; this distinction, however, is not general, for sometimes the mica is seen in ancient obelisks. The characters engraven on all the four sides of those monoliths remained a mystery until some thirty years ago, when the Rosetta stone first gave the key to open it: it seems clear that the ancient Romans knew little of the meaning of those characters, all that Pliny could tell us about them was that the hieroglyphic inscriptions are Egyptian letters, and that the large obelisks brought to Rome by Augustus had engraven upon them, the meaning of nature according to the Egyptian philosophy. Ammianus Marcellinus, who had studied the books of Hermapion, could tell us that the hieroglyhics contained the principles of ancient wisdom, and he says that single characters expressed nouns and verbs and sometimes entire sentences. In modern times we have the voluminous works of the Padre Kircher, in which the most fanciful interpretations are enveloped in thick coats of learning. Warburton's lucubrations are mere theories made to square with his views of certain passages of Scripture; but the learned Swede Zoega, profound in Coptical learning, saw as far into these masses of granite as any scientific eye could penetrate before the last discoveries. We have now learnt that there are three sorts of hieroglyphics:—First, the Hierophantic or sacerdotal characters, the science of painting ideas, or the sounds of a language; here the Egyptian priests carried on a system of mystification by adopting conventional symbols understood only among themselves, it was not writing, but signs, where the figure of a bird or an animal or some object stood for a word or a sentence, as Marcellinus intimates; of this sort of hieroglyphics little is yet known. The second sort of hieroglyphics is called the Demotic, or language of the people (sometimes also called Enchorial, or the dialect of the country or province), here the Egyptian characters are rendered into the popular language or Coptic (the ancient language of the Egyptians); the Rosetta stone helped to make this discovery. The third sort of hieroglyphics is the

Phonetic; that is, certain figures enclosed in ovals stand for letters, which, when put together, form a word where vowels are mainly to be supplied, as for instance KASRS for KAISAROS, &c. a mode of reading which puts one's faith to some trials, but which, however, is too clearly made out to dispute the principle.

I shall now proceed to bring before you the twelve obelisks existing at Rome. And here again, as in other great matters, we have three courses. First, those remarkable monuments may be considered in the order of their antiquity, beginning from their origin in Egypt to the date of their transport to Rome, and from that to the present day. Secondly, they may be taken in the order of erection on the places where they now stand, which would limit us between the year 1586 and 1817. And thirdly, we may view them in the order of their magnitude. The last mode of considering them will be the most convenient, for the references to their respective ages and dates of erection may be easily supplied: as to the antiquity of the genuine ones it will be found that they are mostly of the same period, *i. e.* within the 70 years of the reign of the great Rhamses. The first in point of size and importance is the Lateran Obelisk. This splendid monolith was originally erected at Thebes in Upper Egypt, in the Propylæum of the Temple of Ammon-ra. Pliny says it was erected during the reign of the Rhamses, who was King of Egypt during the Trojan war. But obelisk readers discover upon it also the name of Thoutmosis or Thutmes III or IV, the fifth king of the 18th Dynasty, who is the same as the Mœris of the Greeks so renowned for the formation of the lake which bore his name. Ungarelli, the Barnabite Monk, assigns it an antiquity of 1740 years before the Christian era. If we are to believe Pliny, the king who first set it up was nervously interested in its safe erection, and fearing the machinery employed would be insufficient, without the greatest care, he tied his son to the top of the pyramidion, to ensure, not the safety of the heir to the throne, but the safety of the mass of granite. We should, I think, one and all protest against our heir apparent being staked against such odds, even if it were to secure the safe hanging up of Big Ben at Westminster. The name of Rhamses is also read on this obelisk as having restored the temple which his predecessor Thoutmosis had erected. After remaining for more than 2000 years in its native city it was floated down the Nile to Alexandria by Constantine; that Emperor intended it to embellish his new city on the Bosphorus, but having died before he accomplished his design, his son Constantius preferred to bring it to Rome. In a vessel provided with 300 oars, he caused it to be brought to Ostia, and thence up the Tyber to the Vicus Alexandri, a small landing-place about three miles below Rome; from that place it was dragged slowly on Chamulci, or low-wheeled waggons, through the Piscina Publica, and with considerable labour set up on the Spina of the Circus Maximus, A.D. 357. When it fell from its base it would be in vain to speculate; it was found in 1588 interred at the depth of 24 Roman palms, and broken into three pieces. The vigorous Pope Sixtus V, caused it to be erected under the directions of the celebrated architect Fontana in the place where it now stands, near the Lateran Basilica. It stands upon a large pedestal of red granite, and measures, without the basement, 148 palms; it lost some of its original length in the pieces being put together, but if we measure from the ground to the Cross which crowns it, it stands 204 palmi or 145 feet high; its weight is estimated at 437 tons. It is covered on all the four sides with hieroglyphical characters, which read in three slips or columns from top to bottom; at the base of the pyramidion or Capitulum Trabis, we have a group of two figures with inscriptions above them four times repeated. Ammon, the King of Gods, is seated with his insignia of Deity, and Thutmes or Thoutmousis IV kneels before him; the god holds out to the king the symbol of life while the king presents to Ammon in return two cups of wine; on the left above the god is written "The bestower of perfect life, fortitude and all goodness, Ammon-ra, Lord of thrones, and of both Ægypts, Lord of Heaven who tarries at the seat of Thebes." And again, spoken of Thutmes, "Lord of the upper and Lord of the lower regions, pleasant in his kingdom as the Sun in Heaven." We might go on to read, "Horus resplendent, Distributor of dominions, Guardian of the double watch;" these are sufficient specimens of the style which runs through the whole: as we descend we come upon the name of Rhamses VI. supposed to be the great Sesostris, "greatly beloved of the Sun, he is the friend of truth, he is life-giving as the light," in short these hieroglyphical panegyrics are the very hyperboles of Oriental metaphor. The Sultan is still called in public style and title "Governor of the Earth, Lord of three Continents and two Seas," and very often Hunkier, "the Slayer of Men." Byron entered fully into the sublime phraseology of the Harem, when he introduced old Baba delivering his message to the Sultana—

"Bride of the Sun, and Sister of the Moon
('Twas thus he spake), and Empress of the Earth,
Whose frown would put the spheres all out of tune,
Whose smile makes all the planets dance with mirth,
Your slave brings tidings—he hopes not too soon—
Which your sublime attention may be worth.
The Sun himself has sent me like a ray,
To hint that he is coming up this way."

I know of nothing which gives a better idea of the style and language employed on Egyptian obelisks than this stanza, and it will save me much trouble in reading, and you in hearing the vain repetitions which fill the sides of these monoliths of Egypt.

Leaving now the Lateran Obelisk we come to the next, in point of magnitude, viz. that which now stands in the centre of the Piazza S. Pietro. The main interest attached to this is the account of its erection by Fontana; this peculiar interest arose from its being the first experiment of setting up a fallen obelisk in modern Rome, and from its being in one unbroken mass, weighing 331 tons. It was brought to Rome from Heliopolis by order of Caius Caligula, to ornament the Circus which was subsequently better known by the name of Nero, by whom it was enlarged and embellished; the site of that Circus was where the sacristy of St. Peters now is, and therefore the obelisk stands not more than 300 yards from its original position; it took four months to move it that distance. Sixty cranes, 140 horses, and 600 men were employed in the operation. Our celebrated engineers no doubt performed a greater feat when they took only two months to move the Leviathan ship, but they had all the appliances of modern science, and had the advantage of an inclined plane. Full details of the machinery employed in erecting the obelisk of the Vatican are given in a work by Fontana himself, which you have in the Library of this Institute; the expense of erection amounted to 40,000 scudi, or £9000., and the architect's commission was the value of all the timber, iron, and ropes used in the execution, which were worth £4500.; if anything more should be said by parliamentary economists upon the commission charged by our modern Fontana, I should recommend him to appeal to the tariff of Pope Sixtus V, who gave not five per cent. but fifty. .The Pope had issued an order that no one was to speak above a whisper during the anxious moments of placing the obelisk on its pedestal, upon pain of death, and you have all heard the story of the English sailor who happened to be present and seeing the ropes stretch beyond the calculation, broke the silence by shouting out "Wet the ropes!" But the English sailor has a competitor for fame, the bold advice is attributed to a member of the Bresca family of San Remo: there is an old picture in the Vatican Library which represents the man seized by the guards; he was taken as a culprit before the Pope expecting to be condemned, but instead of executing the threatened punishment, Sixtus told him to name his reward, and he chose the privilege of supplying palm branches to the Sistine Chapel, and his descendants still claim the monopoly. This obelisk was set up in 1586. It is said by Pliny to have been cut out of the Syenite rocks by Nuncoreus the son of Sesostris, and dedicated by him to the Sun, but there is much obscurity about the passage; we are not aware that any genuine Egyptian obelisk was ever set up without figures, but the Vatican

The quotation from M. Champollion, page 171, at the end of the paragraph, should read thus:—Hôrus, Seigneur de la région supérieure et inférieure, fort et clement, ami de la vérité, seigneur des Panégyries* comme son père, le Dieu Phtha, roi du peuple obéissant, Soleil gardien de la vérité, approuvé par Phré, fils du Soleil, chéri d'Ammon, Rhamsès, pieux envers les Dieux, a réparé leur temples, lui, le seigneur du monde, vivificateur comme la lumière.

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* Assemblées civiles ou religieuses.

obelisk is plain: the probability is that it was cut by order of Caligula in the Syenite quarries, and being brought to Rome was dedicated by him, as the inscription still proves, to the memory of Augustus and Tiberius. If we include the base and ornaments at the top the whole height is 127½ feet: it serves as the gnomon of a monster dial, which was traced on the pavememt of the piazza by Pietro Maccarani in 1817, and there it stands between the two beautiful fountains, having completed its 1800 years since it was first set up in the Circus where the first Christians were thrown to the lions.

The Flaminian Obelisk, which salutes the traveller from the North as he enters the Piazza del Popolo, is the third in magnitude, but the first that was introduced into Rome; it is one of the two which Augustus conveyed from Heliopolis, and it was set up on the Spina of the Circus Maximus. The inscription on the pedestal, which is ancient, tells us that Egypt being reduced into the power of the Roman people, the emperor dedicated this trophy to the Sun. This obelisk was discovered among the ruins of the Circus, lying at a depth of 24 feet below the surface; it was broken, like that of the Lateran, into three pieces; it was taken up and removed by order of Sixtus V, in 1589. The height of the whole, from the ground to the summit of the cross, is 115 feet 6 inches. Fontana also designed a beautiful fountain at the same time he set up the obelisk; this was demolished in the Pontificate of Leo XII, and the four lions of Egyptian style, vomiting water into the four round basins, are the invention of Giuseppe Valadier; perhaps he intended the quattro leoni to have some hierophantic allusion to the living Pontiff Leo XII. There is no doubt of this obelisk being a genuine Pharaonic monument; its four sides are covered with hieroglyphics, they run down as they read in three slips, the outside is by Rhamses, the middle by his father Sethos II. It affords matter for an antiquarian dispute, if we were disposed to indulge in the pleasure of doubting. The question would be whether this or the Lateran obelisk is the one which Ammianus Marcellinus found interpreted in the books of Hermapion; Champollion confesses that the reading of Hermapion comes near to his own translation. The obelisk was made by one of the two brothers Mandouci and Susirei, probably the same as Sethos II, and it was originally placed before the Temple of Re Athom at Heliopolis; like all the other genuine obelisks at Rome, it also bears the name of the great Rhamses, who came after Sethos II. It is believed by Egyptologists that this Sethos was the Pharoah who was drowned in the Red Sea, and being held in abhorrence by the Egyptians, his name was effaced from all public monuments; it has been pointed out that the title in some of the ovals on the Popolo obelisk has really been defaced. If this should be ascertained, it would add greatly to the interest of this monument; but there is enough made out to assign to it an antiquity equal to the age of Moses. It was probably cut during the latter part of the residence of the Israelites in Egypt by the new king, that is, the king of a new dynasty, who knew not Joseph. On the southern side of the obelisk, M. Champollion reads thus—Horus Seigneur de la region superieure et inferieure, fort et clement, ami de la veritè, seigneur des panègyrics comme son Perè, le Dieu Phtha, roi du peuple obèissant, soleil gardien de la veritè, approuvé par Phrè, fils du Soleil, cheri d'Ammon, Ramses pieux envers les Dieux, a reparè leur temples, lui, le seigneur du monde, vivificateur comme la lumière.—Horus, god of the Sun, is a title of the Egyptian dynasty, and Phrè is an ancient god of the Sun. Sixtus V. did not allow the inscription of Augustus to monopolize the pedestal; he made the Madonna share in the honors of the Sun by a pious turning of a phrase to which no one can object. One of his inscriptions in Latin, when translated, reads thus:—the obelisk speaks, "I rise more august and more joyful in front of the sacred shrine of S. Mary, from whose virgin womb, in the reign of Augustus, the Sun of Righteousness arose." Whatever may be thought of the mixture of sacred and profane on the same base; standing by this monolith in the Piazza del Popolo, it is difficult to contemplate without emotion a genuine object of antiquity which leads us back to the time of Moses.

The other obelisk which Augustus erected in the Campus Martius, known by the title of

Campensis, is the fourth in order of size, and it stands now on the Monte Citorio. It was originally made use of for a meridian, of which Pliny gives us some description. None of the obelisks at Rome have their characters so beautifully executed as this one; it was the admiration of Winkelmann. Pliny tells us it was made by Sesostris, but he seems to have made a mistake between the two which Augustus set up; for on the Solar obelisk is read the name of Psammetichus I, the 26th of the Pharaonic dynasty, date from 654 to 509 before the Christian era. Psammetichus was the father of Pharoah Necho, who killed Josias King of Judah, and took his son Joachaz a prisoner into Egypt. He styles himself "The wakeful Lord and King of Upper and Lower Egypt," and he erected the obelisk at Hierapolis, from whence Augustus brought it to Rome. After thirty years, for some cause which Pliny cannot explain, the sun-dial of which it was the gnomon went wrong. Some of the lines of the dial were brought to light in laying the foundation of the Sacristy of San Lorenzo in Lucina, in 1463. The obelisk itself near the site of the church was seen, for the first time, in the Pontificate of Julius II. Pope Sixtus V. did not think it worth his while to gather it up. Benedict XIV. caused it to be extracted from the ground by Niccolò Zabaglia, foreman of the handicraftsmen of St. Peter's, and in 1748 he deposited it in the Court of the Palazzo Vignaccia, and put an inscription, which is still there. Finally, Pius VI. (Braschi), in 1792, caused it to be erected in the Piazza Monte Citorio, where it now stands. Its total height is 103 feet 6 inches; it required considerable repairs, and these were done with granite, taken from a column of Antoninus, which was found, much broken, not far off; on the summit, a globe of bronze with a spear's head was placed, and a hole pierced through the globe to let the sun's rays pass through at mid-day. It is of all the obelisks at Rome the one that had suffered most. It does not appear, from Pliny's account of this obelisk, that the Romans knew much about the science of dialling, and some of them had rather that such inventions for keeping time had never been brought into practice. Timepieces are very disagreeable to the lovers of the dolce far niente. My friend, Mr. Thomson, of Banchory, to whose paper on obelisks, read two years ago in Edinburgh, I am vastly indebted, has taken from Thornton's translation of Plautus a fragment preserved by Aulus Gellius, in which an idle fellow anathematizes the invention of dials.

The gods confound the man who first found out
How to distinguish hours! confound him too
Who in this place set up a sun-dial,
To cut and hack my days so wretchedly
Into small portions. When I was a boy
My belly was my sun-dial, one more sure,
Truer, and more exact than any of them.
This dial told me when 'twas proper time
To go to dinner, when I had aught to eat;
But now a days, why, even when I have,
I can't fall to unless the sun give leave.

The fifth obelisk in height now stands in the Piazza Navona. It is known by the name of the Pamphilian, so called from the family name, Pamfili, of Pope Innocent X, who, in 1651, employed Bernini to gather up the pieces, and set it up, where it now is, in front of the Church of S. Agnese, towering above a fountain; which, if not the most tasteful, is one of the most curious devices we meet with at Rome. This obelisk was first used for adorning the Circus Agonalis, the site of which is now occupied by the Piazza Navona, and it is now known to have been cut by Domitian. The penetrating eye of Winkelmann detected the imitation long before the hieroglyphic writing was discovered. Dr. Young also detected the comparatively modern cutting of the characters. We are now enabled, with the aid of Champollion's Phonetic Alphabet, and Dr. Young's illustration, to read upon it the name and title of Domitian. This will serve as a specimen of Phonetic writing. All that these two ovals contain amounts to Cæsar, Domitianus, Augustus, Imperator. The Padre Kircher, who published six great folios in 1636, by way of explaining the obelisks, thus reads the cartouche, which contains Cæsar, Domitianus, Augustus.—"The beneficent Being who presides over reproduction, who "enjoys heavenly dominion, and four-fold power, commits the atmosphere by means of Mophtha, the "beneficent principle of atmospheric humidity unto Ammon most powerful over the lower parts of the "world, who, by means of an image and appropriate ceremonies, is drawn to the exercising of his power." After this flight of the imagination and learning run mad, we may safely consign the six folio volumes of Father Kircher to the old book-stalls in Holborn. From the Circus Agonalis this obelisk was transferred, about A.D. 307, by Romulus, the son of Maxentius, to the Circus on the Via Appia, which used to be known as the Circus of Caracalla; there it was found broken in many pieces, and five of the largest fragments were removed and set up where they now stand. Bernini declared he had gathered up every morsel, but in the excavations made by the Duke di Bracciano in 1825, several pieces were found, and the foundations of the pedestal on which it stood, as well as those of the other ornaments. Like all the other great obelisks, this was dedicated by the Romans to the Sun, and it is evident that this idea was borrowed from the Egyptians; it confirms the poetical notion of the origin of the form of the obelisk, that it was a petrified ray of the great luminary. The adoration of the source of light and heat, the most resplendent visible image of an invisible Being, whom the Orientals knew not, was, perhaps, the most sublime worship that the natural man could adopt; and in the fanciful mythology of the Greeks and Romans, perhaps Apollo, the god of light and poesy, is the most respectable personage in Olympus. On the Spina of the Circus his statue stood next to the obelisk, and struck the key note of the allegorical allusions in the chariot race. The Metæ at each end of the Spina (the Obelisk in the middle) represented the East and West, or the Sun's day course; the twelve doors from whence the chariots issued, were the twelve signs of the Zodiac; the four factions, with their respective colours, were emblematical of the four Seasons; the two yoked chariots were the Moon; the four yoked, the Sun; the seven times round the spina, which was the usual length of the race, sometimes symbolized the seven days of the week, and sometimes the seven Planets, the "Equi desultorii," who preceded the chariots, were the morning stars that heralded the day; and thus the poet and the astrologer indulged their imaginations amidst the clamour of the multitude. On the top of the obelisk was a brass globe, called the Pyropus, with an arrow's point looking to the sky; the sun's rays alighting upon the polished brass, made a strong reflector, which seemed to bring the god of day nearer to the race-course. "Flammasque imitante Pyropo,'' is the description of Ovid. The Sun, as Apollo's statue on the spina indicated, presided over the races at Rome. This is more than can be said generally for the races of Epsom, and there does not appear to be any apprehension of Sun worship at our great games. The only similarity between the Derby and the Ludi Circenses, which seems to have survived the effacing power of Time, is, that when the Editor Spectaculorum had announced the time for the great race, the Senate did no business on that day. The top of the obelisk was sometimes adorned with the palm-branches which the victors had won, and sometimes with roses. Nero collected all the crowns he had won, and fastened them on the top of his obelisk in the Vatican Circus; as to roses, the very idea causes Argoli, the learned antiquary, to dance with delight. "Quam-bene,'' he says, "nam obeliscus in spina circi et in obelisco rosa.'' I need not observe where the bon mot lies: spina is a thorn as well as the back-bone of the circus. But enough is now said of the Pamphili Obelisk, which stands above Bernini's Fountain. The shaft is 52½ feet long, the whole height 95½; giving 30 feet for the ornaments of the basement. I must now hasten through the other seven obelisks, and it will suffice to say of the VIth and VIIth.

that they were a pair cut out by the Emperor Claudius, and brought to Rome A.D. 57, for the purpose of being placed on each side of the entrance of the Mausoleum of Augustus. One of them was removed by Sixtus V, in 1587, and placed where it now stands, in the Piazza di S. Maria Maggiore. It was found broken into five pieces, and the jointures are visible. The fellow to this obelisk was not re-erected until 1786, when Pius VI. ordered it to be set up on the Quirinal Hill, between the two famous groups of men and horses. The Esquiline and Quirinal Obelisks have no hieroglyphics and no pyramidion. The length of each shaft is about 47 feet, but that is nearly doubled by the tops and bottoms which are added for ornament and elevation.

The VIIIth now stands on the Trinità dei Monti, where Pius VI. placed it in 1789. It was originally made by Hadrian, whose name, together with that of his wife Sabrina, and his favorite Antinous, was read in the ovals by Champollion; the hieroglyphics are rudely cut. Not improbably it was first erected in Egypt in honor of Antinous, who died in that country, and was canonized as an Egyptian divinity. When and by whom it was brought to Rome, no one knows. It is 44 feet in length, but with base and ornaments 96½ feet. It is known by the name of the Sallustian obelisk.

The IXth is the Aurelian, so called because it was found among the ruins outside the walls of Sta. Croce in Gerusalemme, where the Circus of Aurelian is supposed to have been. It was removed from one place to another, until it was finally erected on the Pincian Hill, in 1822, by Pope Pius VII. It is 53 feet 9 inches high, with its ornaments, but has only 29 feet 9 inches of the genuine Egyptian granite. This, as well as the three smaller ones yet to be mentioned, are covered with hieroglyphics. A temple of Isis and Serapis stood in the Campus Martius, near to where now is the Convent of the Minerva; and this temple has furnished from its ruins, no doubt, the three real Egyptian obelisks which remain to be described. They are respectively 19½ feet, 16 feet, and 8½ feet high. The first, Macuteo, so called from the Piazza San Macuto, where it formerly stood, was removed by Clement XI, in 1711, to where it now is, in front of the Pantheon. The second, the Minervan, was erected by Alexander VII. (Farnese), in 1667. Bernini mounted it on the back of an elephant made by Ercole Ferrata, and the idea is illustrated by one of the Papal inscriptions. The reader is to understand that as the strongest of beasts carries the obelisk, which contains the weight of the learning of the Egyptian sage, so does it belong to a robust mind to sustain the weight of solid sageness. The play is on the word sapientia.* The name of the great Rhamses is said to be read on the other two small obelisks; the last of which is that which now stands in the Mattei Villa, belonging to Price Godoy, better known by the title given to him by the first Napoleon, The Prince of the Peace. The Roman Senate made a present of this obelisk to the Duke Mattei, in 1582. We know nothing of its early history.

Now these twelve obelisks, as they stand in their places at Rome, are not simple shafts as they were made by the Egyptians, but they are all placed upon pedestals (some of them out of all proportion), and they are all surmounted by masses of bronze or metal, the insignia of Popes and other devices. I think we shall all agree that the pyramidion, so suitable to the form of the obelisk, and so indicative of its meaning, ought to have been let alone; and if "Apostolic statues climb, to crush the Imperial urn, whose ashes sleep sublime buried in air," to which I see no objection, that is no reason why Papal emblems should be stuck "on the point of a needle," or be made "to ride on a beam of the sun." If ever then it should happen that we should begin to adorn this metropolis with monoliths from Egypt, or from Aberdeen, I should hope the pyramidion may be left to assert its own dignity in the face of clouds and sunshine. But the question of the basements may fairly be made a subject of discussion, and one object I have in view this evening is to throw that question in medio for more learned and tasteful heads to take up, and I am happy to find that I am to be followed by a gentleman who is as anxious as myself to see monolithic obelisks of a convenient altitude introduced into our metropolis.

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* It is however much more interesting to know that on the Minerva Obelisk is read the name of Psammetichus, the fourth from Psammetichus I, in the Saitic dynasty, 619 A.C.; his memory is preserved in the book of the Prophet Jeremiah, c. xxxvii. The prophet in his reign was taken away into Egypt. He is entitled on the obelisk the begotten of the Sun; the Sun making glad the heart.

I shall not attempt to invade the special province which Mr. Bell is to occupy this evening, but, if I may, I will give him this word of sympathy before he begins, that I am a believer in Entasis, and I should not regret to see my shafts (providing the points are not touched) shooting up from his ornamented basements; but I am particularly anxious to enlist your sympathies for the monolith obelisk as an ornament and durable memorial suited to such a metropolis and such a nation as this. I have no respect for this placing one stone upon another when we have a public monument to erect in honor of a great man; they will all be loosened and want repairing long before Macaulay's New Zealander contemplates the ruins of St. Paul's while standing on London Bridge, but a monolith, if set up in front of the Exchange, might survive to indicate at the end of 3000 years where the three per cents were once done at 98, and where the Egyptian Hall stood by the side of the Egyptian obelisk. Besides, the discoveries which have been made in the most ancient writing of the world are rendering hieroglyphics every day more interesting, and none have more cause to rejoice than we who are the interpreters of our sacred Books in the results of this modern field of literature. Every colossal figure disinterred where Nineveh once stood, and every papyrus that is unrolled confirms the accuracy of our sacred history, every obelisk deciphered contributes something towards completing the succession of the kings of Egypt. We shall soon know the line of Pharoahs from the time of Abraham to the reign of the Ptolemies, and the impugners of the chronology of the Old Testament history will have to go into obscurity before the petrified sun's rays of Egypt. There is something of a Providence in this which we cannot but admire, that in an age remarkable for its craving for material proof of every proposition, which believes little except that which it can see and taste and handle, an age in which scientific discovery had begun to wave the flag of triumph over revolution, there should have been left concealed in the earth, or hid from the knowledge of man, a series of evidences which have proved the accuracy of those Scriptures which were given to make men wise unto salvation. I look forward to a great advancement in this walk of literature. I see no reason why in the course of another generation our national schoolmaster should not by way of a treat to a dozen of his best boys take them out on a half holiday to read the obelisks that may be set up in Trafalgar Square (when it is a square), or Palace Yard, when it becomes an open court, or on the table land of Hyde Park, or in front of Buckingham Palace, and that the name of Victoria in hieroglyphical signs be as familiar to the eye as "God save the Queen" is to the ear.* Have you not all read with perfect ease the hieroglyphical name of the Emperor Domitian, and could not every one here present make a phonetic Victoria and Albert for himself? If ever this scheme should be brought about, I ask no more honour for the suggestion than that our own hieroglyphical symbol with which our honorary secretaries sometimes puzzle the uninitiated, R. I. B. A., may have an oval on the obelisk which is to be first reared at the West End; for R. I. B. A. has as much right to be "a beloved of the Sun," as any "Horus" of ancient time, for R. I. B. A.'s works are all made for the sun to shine upon, and architecture even in its ruins is "beloved of the Moon."

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* In the laborious, skilful, and elegant work of Messrs. Arundale and Bonomi, the hieroglyphic name of Victoria, as ruler of the waves, is at the head of the titlepage.

Vol. I. Transactions of the Royal Society of Literature, 1843, contains a table by Mr. Bonomi, exhibiting all the Egyptian Obelisks then erect.

ON THE APPLICATION OF THE ENTASIS TO THE OBELISK.

By John Bell, Esq.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, May 31st, 1858.

Being a sculptor and not an architect, it is with some hesitation that I make any remarks in addition to what has been said on the subject of obelisks; but perhaps your kindness will receive the few words I have to say with indulgence, as it regards a subject which may be thought to possess some degree of novelty, viz., the consideration whether the principle of the Entasis may not be advantageously applied to the obelisk.

My attention, about three years ago, was drawn to the subject of obelisks by my having selected an obelisk as the principal feature in a design I made about that time for a memorial of the Great Exhibition of '51, in Hyde Park. It was not, however, until my attention had been for some time turned to this architectural feature that it occurred to me that had the Greeks adopted it as they did various other component parts of architecture, for which I believe it is *en regle* to consider that they were indebted to the Egyptians, that there was at least a possibility that they would have modified it, in some degree, as they had done in regard to other architectural features—columns for instance. I believe I am correct in saying, that in whatever the Greeks adopted from other nations they made modifications, making it thus, as it were, their own: and that in passing through their hands the rough-hewn ideas of their neighbours became not unfrequently refined to a degree of perfection that later times have been able to do little more than repeat. If then they had adopted the obelisk, would they have left it as they received it from the Egyptians? I fancy not.

The tomb of Beni Hassan, in Nubia, presents pillars which have received the name of proto-Doric, on account of the remarkable and close similarity which exists between them and those of the Greek Doric Order; and perhaps the chief point in which they do not resemble each other is that the Egyptian type possesses no Entasis, but that the shaft although it tapers from base to summit does so throughout equally and in straight lines, while the Greek Doric has an entasis. In some, however, of the Egyptian columns the shafts contract also at the base, but still, I believe, there is nothing like a scientific entasis, analogous to the Greek in principle, to be found in any of these cases. I shall be glad to be corrected if I am in error in my supposition that thus the scientific compensatory application of the entasis, so as to satisfy the eye thoroughly, was reserved for the Greeks to arrange on just principles and to carry out with exactitude and beauty; I say "compensatory," inasmuch as I presume that a just entasis, or any curve or modification applied on similar principles, is never intended to strike the eye separately, as a form of itself, but merely to be compensatory of some optical delusion by means of a delicate adjustment, by which fulness, harmony, and unity was restored to the whole effect. Mr. Penrose, in his remarkable work on the "Principles of Athenian Architecture," in his analysis of the entasis of the columns of the Parthenon, considers its curve to be hyperbolic, and computes its divergence from the straight line at about 1 in 550 of the height of the shaft. The entasis of the columns of the small and large order of the Propylæum he also considers to be hyperbolic, and computes their divergence as somewhat more, viz., respectively 1 in 500 and 1 in 400.

I did not attempt, of course, in my little sketch a nicety which my means and material would not afford me, but the idea of applying a somewhat similar divergence to the obelisk arose in my mind, from perceiving I fancied a certain crudeness and harshness, and a want of bulk in the centre portion to exist in the rectilinear obelisk as a form, and that the long lateral straight lines even possessed in appearance a somewhat concave character, which suggested compensation, as in a column, and thus it occurred to me to apply to my little model of an obelisk something of the same entasis which Mr. Penrose had recorded of the Athenian columns. The little photographs you see here were taken from this little humble effort on my part, and I may as well enlist your indulgence in its behalf by saying, that the original is only a little plaster model of some 2½ feet high, wholly inadequate in material and scale to at all work out so delicate a problem, and that I merely consider it as a sketch of an idea, by no means presuming either that it rests with me to carry it out. These photographs, also, are on so small a scale, that I must draw rather on your consideration and imagination to accompany the principle of the suggestion than think to illustrate it by means so inadequate. I may, however, here perhaps be allowed to suggest, in case the idea in question finds favour sufficient to encourage its being worked out as an architectural problem, that perhaps slate would be an appropriate material for a test model, which, for the better working out of the several delicate curves, should not, I think, be less than 5 or 6 feet high. I only say this to guard against its being thought necessary for the working out of the problem, that this should be done of large size, or in granite.

However, to return to what I was saying, the first thing I did after I had tried my hand roughly on the effect of the entasis so applied to the obelisk, was to find out, if I could, whether it had been done before, and the work I chiefly consulted on this point was Denon's large work on Egypt. I read a good deal of the letter-press and examined the engravings of various of the most celebrated obelisks of Egypt, which are, as you know, there figured on a large scale, without, however, meeting with any instance of entasis applied to them. Nor have any enquiries I have made, or any information which has been kindly afforded me since, indicated the existence of any divergence as regards the contours of the Egyptian obelisks, except in so far as the faces are found occasionally slightly horizontally rounded; for which perhaps a sufficient reason is perceptible in that this treatment equalized in some degree the width of the elevation and angle views, adding slightly to the former and taking away slightly from the latter. I have not met with any evidence of the Egyptians having gone any further than this in the modification of the rectilinear contours of the obelisk; and in this case it may be observed that the slight divergence is only applied to the sectional plan of the obelisk, and not to any of its upward contours. Neither have I been able to discover any modern instance of the entasis having been applied to the obelisk, although I can hardly fancy but what a similar idea must have occurred to others.

All rectilinear surfaces, bounded by angles, may be perceived I think, when narrowly examined, to have a tendency towards looking concave, whether viewed in front or in profile. And, as I have just said, the contours of a rectilinear obelisk partakes, to my eyes, strongly of this character, especially along the sides of the shaft in profile, indicating a yearning for some kind of compensatory addition and refinement analogous to that which the sensitive and subtle taste of the Greeks found requisite to satisfy their sense of proportion in the column. I am aware, however, that the problem of entasis, as applied to the obelisk is less simple than as applied to a column, in that the first is four-sided, and the column is round. A column, from its cylindrical nature presents a similar appearance in each view (flutes making but an unappreciable difference), whereas the obelisk being four sided and four angled, the curve of entasis on the angles, although directly evolved from the meeting of the curves of entasis of the sides, would vary perceptibly from that of the latter. I have not, however, gone into the delicacies of this question, nor have I tried anything like an arithmetical calculation of the other curves consequent on the introduction of the entasis on the sides. I say consequent because, even on my little inadequate and insufficient model, as soon as I had applied the entasis to its sides I directly felt that the other lines and surfaces required a similar treatment to make them harmonise with the entasis. Not only did I find that the surfaces of the shaft required rounding, but also that the surfaces of the culminating triangle at the apex, which thus (with a slight entasis on its upward contours, which became requisite as soon as the entasis was made on the shaft) came to assume the form of a triangle, not of straight lines but of three arcs all arching slightly upwards, thus in this acute angled triangle partaking of a curvilinear modification in the same spirit as that applied to the obtuse-angled triangle of the pediment of the Parthenon. Thus in my experience, such as it was, did I find that the introduction of the entasis along the sides of the obelisk induced essentially, as a consequence, a further curvilinear treatment, and that its mission did not appear to end until all the surfaces and lines became also endued with the same principle; nor did the eye appear at all satisfied after the introduction of the entasis while a single straight line remained on any part of the obelisk. On contrasting the little obelisk thus treated with a little example of the same size I had by me in its original state, I must confess that the curvilinear obelisk appeared to me to possess a marked superiority. The rectilinear one, by the side of its companion, seemed to me in comparison to look crude and harsh, and to have a kind of cast iron appearance; while on the other hand the one on which I had been trying my curvilinear experiment, seemed to have gained in richness, mellowness, and completeness. I feel, of course, I may be all wrong, but yet at present I must acknowledge that the incomplete trial I have made does impress me with the belief that if the proper curves for this feature were discovered and judiciously applied, that the result might become in other hands an object of marked beauty. However, I have still a little more to say on this subject. I had in my little obelisk posed it on a base partaking of the forms of a cube and a paramid, and I found that these surfaces also, when associated with the above treatment of the obelisk, in like manner demanded a similar treatment, so that I did not stop with my rasp and sand-paper until I had reduced all their surfaces and lines also to a similar curvilinear character, still, however, working on the same principle of emulating the precedent existing in the ruins of the Parthenon and other Greek temples, in which we are instructed that the base and foundation lines were slightly arched, as well as those of the column and the tympanum.

In regard to the importance of the obelisk in a monumental point of view, perhaps I may be allowed to say a few words. There is no doubt that in the decoration of a city or its entourage, as in landscape generally, it is desirable occasionally to have high objects of an agreeable form, not only as they effect the skyline and in a directly architectural point of view, and as a centre of roads and avenues, but as drawing attention to some public record erected "in memoriam" of some great man, or fact, or historical incident. Now a column has always been held, I believe, to be open to some objection when used for this purpose, inasmuch as it is a portion of a building removed from its legitimate office and original object, and in an isolated position set forth to do that for which it was not in the first instance designed. It cannot be denied, indeed, that a column used in this way is in some degree an adaptation.

Now, these observations do not apply to an obelisk, which was from the first a feature of itself, not of support but of record, which was set forth, not unfrequently in a twin arrangement, by the side and in advance of the entrances of Egyptian edifices: the obelisk from its inscribed surface being a sort of architectural open book. Thus we have very early authority for this feature being used as a record, for the inscription of which the plain obelistic surface affords a special and peculiar facility. Moreover, a column being designed originally to support something, it artistically demands a finial of some sort, and if erected in honour of any individual, this its quality has frequently led to the placing of his portrait statue on its summit. Now, I would be far from presuming to make any sweeping objection; but, at any rate, such a situation for a portrait statue is open to remark, as involving an undue distance at which to view a likeness.

Now an obelisk yearns for no such architectural addition. It requires no finial, and indeed, in my idea, any supplemental finial stops its upwardness and destroys its effect. It is complete in itself as a feature of distinction without any addition breaking its line; its surfaces afford ample and appropriate spaces for inscription (of which I think we are much too chary in this country), and its plain and simple base forms an excellent background to a figure placed slightly in advance of it. It is in connection with these requirements of the day, and the qualities of the obelisk as a monumental feature, that it appears to me well worthy of consideration, as well as on more abstractedly artistic grounds, and especially so, if by treatment it can be made our own.

The pyramid and the obelisk if not directly the remains of hill worship and mountain associations. appear to have been directly suggested by these objects of nature. A pyramid is a scarped hill, an obelisk is a splinter of rock fashioned on four sides. For the latter object in nature we have not to leave our own country, the Needles at the Isle of Wight and various other spicula of rock formation of still more suggestive contours, to be found in various parts of our Islands, suggest the type which the Egyptian, in my idea, only carried out in art as it were half-way; that is, to the point at which his architecture rested, and during the ages that have elapsed since his time, the problem does not appear to have been carried any further. I am not aware that the Greek ever touched it. Now, the question I would submit is—Does there or does there not exist in the obelisk an interesting architectural problem yet unsolved? You are architects, and you know much better than I do, I am only a humble admirer of your art—but perhaps, I may not be thought to show this humility in thus uttering my impression that the artistic problem of the obelisk remains still unsolved.

Perhaps I may be allowed to add, that having made enquiries as to the possibilty of obtaining monolith obelisks of large size in British granite, I find nothing to prevent it, but that on the contrary, our Isles will afford them of as large a size as any of the Egyptian examples, and probably indeed larger. The quarries of Cheesewring and Lamorna in Cornwall seem especially able to supply such. The weight of such monoliths, if large, of course is great; one of 75 feet for instance, would weigh about 250 tons. But the Egyptians quarried, and moved and erected much greater masses, and they had neither gunpowder, steam nor hydraulic rams. The age of Victoria, is in engineering, I should hope, at least equal to that of the Pharaohs. If I am right, the completing the problem of the obelisk left untouched since their time, and the executing and erecting it (in monolith) in polished British granite, of a size superior to any known example hitherto produced, would (if called for on any occasion) appear to be a triumph of architectural and engineering skill not unworthy of the age and country.

I have, however, but made a sketch and ventured a suggestion, and in this most incomplete and initiatory state, I beg to submit to the Institute of British Architects the problem of applying "Entasis and curvilinear treatment of a compensatory character to the obelisk," and to thank you much for the attention you have before, as well as to night, so kindly bestowed on my crude ideas.

Mr. Tite, M.P., said he had no doubt Mr. Bell was perfectly right in his remarks on the application of the entasis to obelisks. When observing the obelisks in Rome, and that at Paris, he had always felt the insufficiency of their form, and the hollowness of their outline; and the judicious application of a curve he had not the slightest doubt would improve their artistic effect. He agreed with the Rev. Mr. Burgess as to the desirability of introducing the obelisk for monumental purposes. and he particularly regretted that an opportunity had recently been lost, for its employment as a memorial of the Great Exhibition in Hyde Park. He had assisted the Committee in selecting a design for that memorial, and without the slightest idea that Mr. Bell had suggested an obelisk he had ventured to think that the site of the Exhibition was exactly the situation for an obelisk towering above the trees. There was also the highest authority in support of this view, for it was pretty well understood that the Prince Consort desired that the monument should be an obelisk. He (Mr. Tite) was however in a minority on that question, the majority of the committee preferring a group of statues, which, for his own part, he did not think so well adapted to the situation or the climate as an obelisk. Statues in the open air suffered much from the English climate, and required a greater play of light and shade, and a light approaching in constancy and brilliancy that of Italy or Greece. The grouping of the statues would be imperfectly seen at a distance; while an obelisk, from its simplicity of form and character, would be the finest possible monument in point of taste that could be employed in such a situation. One of the most agreeable instances of the modern employment of the obelisk was that in the Torlonia gardens outside the walls of Rome. The form and proportions of that obelisk were of the best possible kind, and it was an interesting fact that the idea suggested by the Rev. Mr. Burgess had occurred to the archæologists of Rome, for the names of the Baron Torlonia with those of the Baroness and of the architect who set up the obelisk, were inscribed upon it in phonetic characters in cartouches. The most agreeable example in this country was an obelisk of the time of the Ptolemies brought from Philæ, and set up, he believed, by Mr. Bankes in his park in Dorsetshire. It had often occurred to him that no better kind of monument, and no better form than that of the Philæ obelisk could be adopted for park scenery in England. Small models of this obelisk were commonly made and sold in Derbyshire. Mr. Burgess had spoken of the merits of Fontana, and he might add that that great architect had the further merit of exceeding fairness, and an entire absence of jealousy or absurd vanity,—inasmuch as he allowed his carpenter (Zabaglia), to whom he was indebted for the arrangements for raising the great obelisk, the use of his engravings to illustrate a work published by Zabaglia. In fact the plates in Fontana's book were the same as those in the work of Zabaglia. Mr. Tite proceeded to observe that he had paid considerable attention to the subject of Egyptian hieroglyphics, and he was very anxious to impress upon the meeting that great injustice had been done to Dr. Young, to whom Champollion was indebted for the suggestion of the Egyptian phonetic alphabet. Dr. Young was the first to decipher the proper names on the Rosetta stone, and to shew, before the idea occurred to Champollion, that the cartouche generally contained the name of the King, the Emperor, or the God. The facts of the case were all given, and traced *ab initio*, in the life of Dr. Young, which had been recently published. He had no desire to detract from the extraordinary skill, ingenuity, and industry of Champollion; but the French were so uncommonly fond of assuming, a little unfairly, the merit of these discoveries, that he thought every one who knew the facts was bound to do justice to Dr. Young whenever an opportunity occurred of doing so. With regard to the two Luxor Obelisks, it was a curious fact that the upper part of the shaft had evidently been cut, or sunk back, so as to allow a pyramidion of metal to be fitted on to it, without interfering with the regular line of the obelisk. It might be presumed that the metal pyramidion was without any decoration at the top, and probably its surface was polished, in order (as Mr. Burgess had suggested) that the sun's rays might be reflected from it more directly. Modern hieroglyphics had been very successfully employed at Berlin. One of the courts of the Great Museum there was a restoration of the temple of Denderah. It contained the Egyptian Antiquities collected under the care of Dr. Lepsius, and a long inscription on the frieze gave in hieroglyphics the facts of the construction of the museum, the name of the King of Prussia, under whom it was erected, the date of the work, and other circumstances connected with it; the whole of the hieroglyphics being very well arranged and very intelligible. He was sure the feeling of the meeting must be now, as it had often been before, one of extreme obligation to Mr. Burgess, and of gratification that he should be able year after year to contribute papers of such extraordinary interest. He wished they would themselves follow such an excellent example; for if Mr. Burgess, with his numerous occupations, could do so much for art and archæology as he was constantly doing, they were bound themselves to do a great deal more. Their thanks on this occasion which he had much pleasure in proposing, would, he had no doubt, be very hearty and sincere. The question of moving large masses of stone was one of much interest. All the facilities of modern ingenuity had been applied to move the great monolithic mass of granite for the statue of Peter the Great from the marshes of Finland to St. Petersburg. The library of the Institute contained a French work by Count Carburi, describing the whole process. The stone had to be moved seven miles through the marshes from the spot where it was found, to the sea, where a ship had been built to receive it. The French engineer who conducted the operations had long plates of iron fitted into balks of timber, and these iron plates had triangular grooves from end to end, and the timber balks were kept in their places under this enormous stone by means of a proper frame-work. The rolling power consisted of large balls of gun metal, resembling cannon balls. The balls were so placed as to impinge upon the triangular grooves, and it was found that there was no friction whatever. As the stone moved on, the timber balks were tilted and shifted forward, and the whole thing was done with great facility and economy, aided as it was by the ground being in a frozen state. It was much to be regretted that the simple principle adopted in this instance had been forgotten in launching the Leviathan, where the mischief had arisen from the use of iron plates acting upon an incline of the same metal, the friction being so great that the one would not slide over the other, even with the advantage of an inclined plane. Engineers commonly used brass, copper, or some other metal in contact with iron to prevent friction; but by the forgetfulness of this principle by the engineers in launching the Leviathan, an enormous expense and delay had been incurred. He was afraid there would be great difficulty in getting large stones for obelisks from Scotland or Cornwall. The quarry-masters made great difficulties about it. He on one occasion required a large block of red granite from the Peterhead quarries, but was told he could not have it because the bridges over the streams which might have been crossed would not bear the weight of it. The truth, however, seemed to be that the present generation built less for posterity, and in a more make shift way than the Egyptians and the Romans; and in fact shrunk from those efforts which the appliances of modern ingenuity would render easily practicable. Cleopatra's needle was allowed to lie perishing, half buried in the sand,—pieces being broken off every day by the donkey boys to gratify the English traveller; and this because neither the government nor anybody else, in spite of many efforts to induce them, were willing to incur the expense of removing it. The useful was now cultivated more than the ornamental, and when an opportunity for the latter occurred, it too often happened, as in the case of the memorial of the exhibition of 1851, that a mistake was made in the character of the monument selected. He thought that a similar mistake had been made in the Edinburgh monument to Sir Walter Scott, which his friend Mr. Playfair had suggested should be an obelisk, not only as a matter of taste, but because Edinburgh, however beautiful in itself, required spires or obelisks to increase its picturesque effect. This suggestion, however, as the meeting knew, had been over-ruled.

Mr. Bonomi, Visitor, said M. Lebas, the Engineer, had found that both the Luxor Obelisks were curved on plan on the east and west faces, but in elevation the east surface was concave, and the west convex. The exact measure of these curves were given in the work of M. Lebas. Mr. Angell had suggested the erection of scaffolding to measure the obelisks in Rome, with a view to ascertain if they really had any entasis, but no attempts had ever been made to settle the question by actual measurement. Hieroglyphic and phonetic characters had been successfully employed in the inscriptions on the Egyptian Court in the Crystal Palace. These were similar to the Berlin inscription, and written by Mr. Scharf.

Mr. **Scoles**, V.P., stated that Mr. Bonomi had himself applied hieroglyphics to form the name of Her Majesty long before Lepsius or the erection of the Crystal Palace.

The Chairman, R. C. Hussey, V.P., said that there appeared to be a prejudice against obelisks, partly from their liability to interfere with the effect of neighbouring church spires, and partly from their resemblance to the lofty chimnies of manufacturing towns. He had been told that when the Luxor Obelisk was raised in Paris, the English Government waited to ascertain the cost of the operation before deciding as to the removal of Cleopatra's needle to this country; but finding that the French obelisk had cost £80,000., they were afraid to ask the Chancellor of the Exchequer for so large a sum.

Mr. C. H. **Smith**, H. M., referred to the Nelson obelisk at Glasgow, which he believed was larger than any which had been described, but which was built of an immense number of blocks of stone. With regard to the removal of large masses, the only difficulty was that of finding the money requisite. At one of the earliest meetings of the Institute an account had been read of the removal of the great light-house at Sunderland. This was 120 feet high and 18 feet diameter, and under the superintendance of Mr. Murray it was moved bodily, in an upright position, a distance of 120 yards, and placed upon a new foundation.

The thanks of the meeting having been voted to Mr. Burgess and to Mr. Bell;

Mr. **Bell** acknowledged the compliment, and said that he believed, from inquiries he had made, that there would be no difficulty in obtaining a block of granite 60 feet long from the Lamorna quarry, Cornwall, for about £5,000., and that it might be conveyed by a timber-ship which had a long hold adapted to the purpose. Its removal on land might be managed by the employment of a number of runners and slips of soaped wood. He had seen this plan used at the French Exhibition of 1855, and he understood it was applied to the moving of masses of great weight with facility and rapidity.

The Rev. Mr. **Burgess** thanked the meeting for its approval of his exertions, which were a source of much pleasure to himself. He was really anxious to see some of these fine monolithic monuments occupying the eligible sites afforded in different parts of the metropolis. The great difficulty was to move the Government to spend money in ornamenting the metropolis; but as everything must have a beginning, and as he believed the question only required to be agitated, he should be much gratified if any good result should proceed from the present discussion and from this Institute. He was quite sure if a "Demotic, Phonetic, Obelisk-moving Joint Stock Company" were formed, the practical difficulties would wonderfully soon be removed.

It having been decided that the discussion should be resumed at the next meeting, the members adjourned.

CORRIGENDA.

"In Wayside Memoranda" by T. L. Donaldson, read April 26, 1858, page 145, third line from the bottom, for "*crypt* of the church," read *crux* of the church; page 146, third paragraph, last line, for *indicate* themselves, read *vindicate* themselves.

A DISCUSSION ON OBELISKS AND MONOLITHS AS ORNAMENTS OF GREAT CITIES.

Held at the Ordinary General Meeting of the Royal Institute of British Architects, June 14, 1858.

The discussion adjourned at the last meeting was resumed by the Honorary Secretary reading the following communication from Sir **Gardner Wilkinson**, Honorary Member.

It has been recommended that obelisks should be adopted in this country for monumental purposes, and the fact of our possessing granite quarries of sufficient size to furnish obelisks even larger, if required, than any erected in Egypt, shows that at least there is no objection to their use from the deficiency of proper materials.

But it may be asked what idea we associate with an obelisk, and what is our plea for adopting it as a monument? We have no feeling, no association, connected with an obelisk. The Egyptians *had* a reason for its invention and for its employment. And certainly, judging from the position and treatment of obelisks in modern as well as ancient Rome, in France, and in England, it is very evident that there has generally been a misunderstanding of their use and intention. In Italy the point of its *pyramidion*, one of its most beautiful features, has been so overloaded with crosses, rays, and various conceits, as to be deprived of its proper effect, while the lower part of the obelisk has been disfigured by being perched on an incongruous pedestal. Again, it has been generally put up in some open space, as if it were a gnomon; and as its form has been spoilt by an unsuitable addition to its base and apex, so the choice of position has aided in its disfigurement. It is true *we* do not encumber the summit with monstrous excrescences, yet we generally spoil it by depressing the apex, and substituting for its graceful acute point a heavy obtuse one; showing how little we even care to copy correctly the ready-made model. So far from any Egyptian obelisk having that heavy character, its triangular pyramidion is at least 1½ in height to a base of 1, which gives it that lightness for which it is so justly admired. Thus in the obelisk at Heliopolis the height of the pyramidion to its own base is as 1½ to 1; which is the usual proportion of the perpendicular height to the length of the base of the pyramidion, in obelisks erected or represented by the Egyptians. But besides a frequent disregard for the proportion and beauty of the apex, we show the same misappreciation of the purpose and character of an obelisk as the Italians and the French, by placing it alone in an open space, as if it was admirable only for its height. The Egyptians employed the obelisk as a contrast to the long horizontal lines of the cornice of their temples; and two obelisks were placed for this purpose in front of the towers of their propylæa. They well understood the value of this vertical line, to relieve, and contrast with, the long horizontal line of the building; and by these means what would have had a monotonous, presented a pleasing, effect. The Romans felt a similar want of the vertical line; but they managed it less adroitly; they merely took one member out of a building, and placed it by itself as a new and distinct monument; and the column increased to an unreasonable size was (with their usual poverty of inventive design and deficiency of taste) adopted by them for the purpose. We have not the same want of the vertical line; it abounds with us; and under much better conditions than in a Roman city; we have therefore no object in adopting either the obelisk, or the column, to supply that want.

Besides, to copy the obelisk, with which we have no association of ideas, gives the impression of inability to compose a monumental design. It is a mere repetition of a well known form (even if correctly copied); and if men of talent are to do themselves credit by designing monuments displaying originality and some mental power, they should scarcely be satisfied with the copy of an object adapted neither to our wants, nor to our ideas. An obelisk before an Egyptian temple is deserving of admiration, because it fulfils the purpose for which it was intended: its form is graceful; and the hieroglyphics also add to its beauty when well cut. These indeed are an important feature in the obelisk; it appears heavy without them; and never looks well, even in its proper place before an Egyptian temple, when unsculptured. But I do not suppose that any copier of an obelisk would advocate the addition of hieroglyphics in this country. If then it is not consistent to preserve this one of its peculiar and pleasing features, how can it be consistent to adopt the obelisk itself, which is injured by their omission? and I see no plea for its adoption as a monument, when neither its object nor its proper position are regarded.

Mr. Kerr, Fellow, said that, whilst acknowledging the ability displayed in the papers by Mr. Burgess and Mr. Bell, he was disposed to question first the extreme antiquity assigned by the former gentleman to the great works of Egypt. These Mr. Burgess ascribed to the time of Moses. It was quite natural that the monuments of ancient Egypt should be traditionally connected with the important historical epoch in which Moses lived. He, however, thought this idea would not bear investigation, and that those, who were learned in Egyptian chronology, would acknowledge that the theories on this subject were uncertain, and had not been reduced to such a form as to be capable of ordinary proof. Viewed by themselves, the writings of Moses would be found to present a very complete description of the state of society at the time he wrote; and in his (Mr. Kerr's) opinion, it was impossible the great works of Egypt could have then existed without being noticed by him. In his history, Moses described a very primitive state of society, and a very small population in Egypt; for the Israelites were more mighty than the Egyptians, their masters; and upon the whole he gave such a straightforward account of the state of society in his time, that (even if the Egyptian chronologists were more correct and certain than he believed them to be), he, Mr. Kerr, would be unwilling to admit that such monuments as those under consideration had then been in existence. Passing from this branch of the subject, he observed that Mr. Burgess had appeared to give the weight of his opinion to the idea, that in the power of moving large masses of stone the Egyptians must have possessed some mechanical appliances, which had now been lost sight of. It was, however, unnecessary to dwell upon this point, because upon the very monuments themselves there were complete representations of the way in which they had been exçavated and carried down the Nile, and from these it was clear that no mechanical power of any importance was used, but that these great masses were chiefly moved by means of ropes drawn by men. The Egyptian, in handling his obelisk, had only to convey it to the site of erection; but the Romans, who had borrowed from the Egyptian, and not made any for themselves, had to lift it in the air, when transferred to Italy, a performance which demanded twice the effort required on the part of the Egyptian. The Egyptians had no knowledge whatever of the mechanical powers, so called; but they nevertheless succeeded in moving these monoliths by manual labour, and patience, and painful effort, such as at the present day we could form no idea of. So far as he could recollect, Mr. Burgess had thrown out the idea, that the Egyptians regarded the obelisk as symbolizing a petrified ray of the sun. Nothing, however, he conceived, could be more fatal to a proper conception of the Egyptians of that period, who had, in fact, no poetry whatever in their minds; and he considered that the stanza which Mr. Burgess had quoted from Lord Byron would convey a most fallacious idea of their phraseology. He thought Mr. Burgess had further been guilty of false antiquarianism, in stating that the obelisk was named after a "spit,"—but this he would leave as a question for others more learned than himself. He would proceed to the question of Entasis, which had been treated with so much ability and modesty by Mr. Bell. He thought that gentleman was mistaken in the position he had taken; and that it was impossible for entasis to exist in an Egyptian design. It appeared to him that entasis was part and parcel of that system, which was peculiarly Greek, and which made the Greeks quibbling, doubtful, and uncertain, whether a straight line did not want some curvature, or whether two and two could make four, without some little help. It was not for the meeting on the present occasion to enter fully into that question, but it did seem to him that the Greeks pushed the scientific details of the philosophy of architecture to an extreme, which could not now be followed out. He thought that the existence of entasis in a column would at once be discerned by the educated eye, and if so there would be an end to the controversy. The reproduction of obelisks in this country seemed to be the primary object of Mr. Burgess's paper, and he had pointed to Rome and Paris as furnishing examples to be followed in London. There, however, the obelisks had been merely carried from Egypt, and set up as trophies of victory and conquest. He was quite sure, that England's "Cleopatra's Needle" would lie under the sands of Egypt till the day of judgment, so far as this country was concerned. The principle, which applied to this question in England was, that money could be appropriated to better purposes than to raising obelisks. Yet if a granite monolith could be erected and polished, it would be a most beautiful monument for the purpose for which Mr. Bell's design had been prepared. That design in itself was admirable, and if a committee of artists had been appointed to determine on the selection, instead of a highly respectable committee of aldermen and other non-professional gentlemen, Mr. Bell might have been more successful.

The Honorary Secretary proceeded to read

SOME REMARKS ON THE APPEARANCE OF STRAIGHT LINES IN WORKS OF ART, by Mr. C. H. SMITH, Hon. Member.

A desire to improve our Architectural taste, or to discover the best mode of doing anything, is not only natural, but laudable; it is only when this desire is indulged to excess, that it becomes dangerous. In every age and community, some particular theory of taste, or peculiar idea of perfection in the Fine Arts, operates for a time on the public mind, to which all must, more or less, comform, who aspire to please, or hope to be received in good company. Never having seen a specimen of Greek Architecture, except in museums, it is not without considerable hesitation that I venture to offer a few sentiments upon this abstruse subject. I have carefully perused the various writings which bear upon it, especially that very learned volume, in which Mr. Penrose gives us the result of his investigation of the various delicate curves, which form the principal lines of certain Greek buildings, erected during the most refined period; he states that "the amount of curvature is so exquisitely managed, that it is not perceptible to a spectator, or at least not until the eye has been educated by considerable study founded on knowledge of the fact." In another part of his work, he informs us that "in some Greek temples, although erected during the very best period of Greek art, the columns have no entasis whatever;" on the authority of Mr. Penrose, therefore, it appears pretty certain that Greek architects did not invariably bend long lines that were intended to appear straight.

In this country, thirty or forty years ago, when scarcely any but Grecian buildings were tolerated, it would have been deemed *barbarism* to have curved a line in a purely Greek edifice. At that period, a celebrated architect gave his mason the drawings of a Doric portico, to be executed during his absence on the continent; no intimation was given that the columns were either to be "swelled" or straight, and they were consequently executed with a *very slight* entasis; so slight, that it was not observed by the architect when he returned, until he had inspected the work several times; but when discovered, it was pronounced to be vulgar, unarchitectural, and the sight even of anything so monstrous could not be endured; and notwithstanding the building was finished, the mason was obliged, at his own expense, to re-work the columns and their flutings, to make them perfectly straight from top to bottom.

As soon as Mr. Inwood had made out the necessary working drawings for the lower portion of St. Pancras Church, he left the work in charge of his two brothers, and proceeded to Athens, in order to ascertain many details of the Erectheum, more correctly than were given in Stuart's work, or to be found in the Elgin collection at the British Museum. When he returned the building had reached the height of the entablature, and, on the authority of Stuart, the Ionic antæ were made parallel and upright; that is, without either diminution or entasis. The architect having ascertained that this was not in accordance with the antique example, had the antæ all re-worked after they were fixed, to diminish the upper part, and give them the proper entasis.

The outer lines of a swelled column represent the frustrum of a parabolic or hyperbolic curve; which is amongst the most perfect of the geometric forms, and may be an improvement upon the straight lined column; but in constructing a large obelisk, much consideration is required before we depart from the simple straight lined form, under the idea of improvement. I am aware of the difficulty of overcoming prejudices in favour of long established practice, in matters relating to art or science; nevertheless, optical effects are now well understood, although some of them may not be easily explained; and the rules of perspective are proved to be perfectly in accordance with nature, and founded upon the strictest mathematical principles; with such aid, we may arrive at far more satisfactory conclusions respecting the appearance of lines variously situated, than can be adduced from opinions founded on some preconceived notions of right or wrong; and which are generally problematic statements without proof.

In constructing an obelisk, is it advisable to make its outlines positively crooked, under the idea that they will then, and only then, appear straight. Or can an object that is decidedly right, true, and correct, under any circumstances look wrong, false, or incorrect. Is it not probable that our sense of vision may be deceptive; that we may receive impressions on the imagination that are not real, and such as may require very attentive consideration; or we may fall into erroneous conclusions. A line that is to represent straightness, or the shortest distance between two points, being intentionally curved, cannot, under any circumstances, represent to the eye correctly that which is intended. Whoever trusts unnecessarily to the accuracy of his eye, and sets positive rules of art at defiance, will, at all times, be liable to make great mistakes. Vision, optical effects, and especially the true principles of perspective, judiciously applied to works of art, tend invariably to perfection. To deviate from them, in ever so slight a degree, is to depart from truth; to pass by the substance and follow the shadow. It is like attempting to improve the multiplication table; or to depress or swell some portion of a circular object, with the view of making it look rounder.

By a similar mode of fallacious reasoning, a long architectural elevation, such as one side of a street, viewed from the opposite houses, ought to be made hollow on the top of the parapet, that is, a little higher at each end, without the least symptom of an angle, just opposite the observer, where it appears to be the highest part. As far as appearances are concerned, this apparent declination towards each end is not altogether fictitious, although, in some respects, it may be termed delusive, for if a straight ruler or string be held up, stretched between the two hands, so as to form a right line, the tops of the houses will exactly coincide with the edge of the ruler or tightened string. Thus, the string being held horizontally, or parallel to the tops of the houses, will affect the eye of the observer precisely in the same way; and the string itself will appear to bend downwards at the ends. This may be demonstrated with mathematical precision, by the doctrine of similar triangles. The same train of argument applies equally to a pilaster built with parallel and perpendicular sides;

as we frequently find in Roman and revived classical works, which is generally considered to appear broader at the top than at the bottom. In this case the spectator allows his imagination (not his eye) to deceive him; the actual appearance (not the measurement) of the breadth of the pilaster at top is smaller than the bottom. Every portion of the pilaster upwards is seen within a smaller visual angle than an equal portion level with the eye; therefore the higher we look, the narrower will be its appearance, until ultimately the parallel lines will altogether disappear and vanish in the zenith, or point precisely over our heads.

Artists may possess much practical knowledge of perspective, and be capable of drawing very clever architectural subjects, either views from nature or imaginary designs, and yet be unacquainted with the true principles of the science. Such artists assert that the rules of perspective are not to be depended upon, and that if strictly followed they occasionally produce unnatural representations; as an instance, they adduce the case of a very high, straight-lined parallel tower, which will, unquestionably, appear in nature to diminish upwards, in every respect the same as a perpendicular pilaster; to represent this object, according to the rules of perspective, we have to make the tower as broad at top as at bottom, and this will be strictly correct. A photograph, if properly taken, would be the same; but if the photographic apparatus be left to one ignorant of the correct mode of placing the instrument, the lines which are perfectly upright in the real object, will be represented in the photograph converging upwards or downwards; and such defects are ignorantly attributed to faults of the lens, or of the process generally. Upright lines in a building will all correspond with the plumb-line, whereas, if such lines are made to converge in a picture, they will not bear the test of the plumb-line; consequently, such a mode of representing the outlines of perpendicular edifices must be false, and unlike the real object.

Mr. Bell, Visitor, asked permission to read some observations.

In recurring to the subject of the last meeting, it gave me no little pleasure to find my ideas in regard to "Entasis and curvilinear treatment applied to the Obelisk" so favourably received by the Institute. The views of the Rev. Mr. Burgess, in his learned and admirable Paper, and the remarks of Mr. Tite and Mr. Bonomi and others, while conveying much most interesting information, were also very gratifying to me in this respect.

An observation, however, which was made by Mr. Hussey, the Chairman on that occasion, calls, I think, for notice, in regard to an objection which has been occasionally raised to obelisks, in that some resemblance exists between them and a manufactory chimney. Of course one must be careful how one admits comparisons of this nature to dim the lustre of fine features of Art, inasmuch as there are few of these that may not in some degree be travestied or paralleled by inferior objects. The fact, however, that many of our tall manufacturing chimneys *do*, in some degree and in some points, resemble the obelisk, does, I think, point to a more careful treatment of that feature of Architecture now than heretofore.

Firstly, as to site, therefore.—I should doubt the advisability of erecting an obelisk in the immediate vicinity of an assemblage of manufactory chimneys; and it is pretty evident, I think, that an obelistic form which might be admirable in a park, or as an ornament in a grand "place" in a metropolis, might be far from judicious in the midst of a manufacturing town.

Secondly, also, the above fact points to obelisks being monolithic.—If it were well at any time that an obelisk should have been *built*, that is, made of many stones, it is not so, I think, *now*. Chimneys are built of many bricks. The character of *construction* is evident in *them*. But an obelisk of record and endurance should be in *one stone*. There is a unity about the very idea that has of itself a world of vigour and poetry about it.

Thirdly.—The same fact points, I think, to the utmost possible degree of *refinement* being applied to this feature, which I conceive can be only afforded by a treatment analogous to that by which the Greeks produced such perfect effects in their features of Architecture, that is, by a curvilinear treatment of a compensatory character applied to lines otherwise straight. And it may be further seen, that the adjustment of this is so delicate, that there would be a vast advantage (in this as well as other respects) in an obelisk being a monolith. The joints, in case of its being built, would in some degree embarrass the perfection of the execution of the contour and its effect when executed, and of course the permanence of the contour of the work would be less. If the Parthenon could have been a monolith—the whole edifice! with what comparative ease and in what perfection we might now view those delicate linear adjustments applied by the tasteful hand of the Greek more than 2,000 years ago! In the case of such a building as the Parthenon, of course a monolith treatment was out of the question. With an obelisk, even of a size superior to any of the Egyptian examples, I believe it now quite possible.

In reference to the point raised by Mr. Hussey, I have myself not the least apprehension that an obelisk appropriately placed, monolithic (and say 100 feet high, of British granite), and gifted with all those refinements of contour that would be supplied by the architects of this country, and perfectly polished, so as to emphasize its lines against the sky with the clearest precision—I say I have in my own mind not the least apprehension that this feature, thus perfected, would have any analogy *in expression* with any common feature of every-day construction.

As a problem of pure form, the obelisk, thus considered, appears to afford an exquisite and peculiar subject for the exercise of Science, Taste, and Art, and the more so from its simplicity and isolated character. I have heard say (although of course I do not venture any opinion on the subject) that it is not a very easy thing to do anything really *new* in Architecture. If so, and if there does exist a special and peculiar feature in this art that *has* been overlooked and left incomplete up to this time, the opportunity it affords in this respect may be held to be proportionably valuable. And if this problem of a perfected obelisk has indeed been left untouched and unsolved since the time of the Pharoahs, for British architects to do out of British granite, why, I say, to me it appears a *glorious opportunity!*

As I have alluded to a monolith of 100 feet, I would further say, that from enquiries from the best sources, I find that this is not probably the largest size that could be yielded by British granite, but that there would be a good prospect that one of still larger dimensions (say of 120 feet) could be obtained. This in size would exceed, I believe, any of the Egyptian examples. It appears to me that the working out of such a problem on such a scale would be one of world-wide interest, and if successfully executed and erected by the architects and engineers of this country (of which there cannot be any doubt, if it were undertaken), that it would be a world-wide triumph. It is, however, merely in the light of an abstract question that I last meeting submitted this subject, and in response to the kind invitation of this Institute, and it is in the same spirit that I allude to it now.

Mr. Lockyer, Associate, said he was of opinion that the erection of a single obelisk was nothing more than a perversion of taste and a travesty. The Egyptians always placed them in pairs, and never separately. The Romans only had employed them singly, as memorials of their conquests, and they had in like manner misapplied the column, which they were not content to use merely in its natural position, but surmounted it by a statue. He differed from Mr. Kerr on two points. In the first place, he believed (in spite of numerous hiatus) that the use of the obelisk could be traced, as Mr. Burgess had stated, up to a date anterior to the time of Moses. In the second place, he considered Mr. Kerr to be very wrong indeed in the view which he had taken of the learning of the time of Moses, and any one who had read the Books of Moses would, he believed, agree with him in that opinion. The prophet was described as skilled in all the learning of the Egyptians, and Egypt must have been a highly populous and cultivated country, having indeed supplied the neighbouring countries for seven years during the famine which prevailed. Egypt must, in fact, have been teeming with population, and its people far advanced in the knowledge of agriculture; besides which, it was recorded that the Israelites were building "treasure cities" for the Egyptians. Mr. Kerr's idea was, that the Israelites had overpowered the Egyptians, but all that was on record went to prove that the Israelites increased and multiplied in the land, but that they had to flee before the Egyptians. It then appeared that a new king arose who knew not Joseph, and there was every reason to believe that the country was conquered by an Ethiopian, or some southern race.

Mr. J. W. **Papworth**, Fellow, referring to Mr. Smith's paper, said that he had appeared to ask the members not to believe the evidence of their own sight, but on the contrary, to believe that the top of a pilaster was wider than the bottom of it.

Mr. **Smith** said he had merely asserted that the eye was not always to be depended upon; adding that the statements in his paper could be demonstrated on mathematical principles.

Mr. **Donaldson**, H.S., F.C., regretted that he had not been present at the last meeting, but he had read the papers then brought before the Institute, and he had now the advantage of having heard the remarks of Mr. Kerr. He could not help stating that he considered there were many fallacies in those remarks; for Mr. Kerr, indeed, had hardly looked upon the question as involving any broad principles whatever. The works of the Egyptians did not appear to create any wonder in the mind of Mr. Kerr, as having been produced by merely physical agency; but to him (Mr. Donaldson) the wonder seemed to be that the Egyptians could have achieved so much by physical force alone, and he was sure that on reflection Mr. Kerr would recall the idea of disrespect to the Egyptians. It was a vast operation to obtain the large stone necessary for an obelisk from the quarry (where the ground was low) and to set it up in its proper position. Many of these quarries were from 30 to 50 feet in depth; and without mechanical aids it was a most difficult and troublesome task for the Egyptians to extract these huge blocks of stone, to get them to their sites in front of the temple, to unship and reship them at each cataract, and transport them considerable distances overland, and then to raise them on to blocks of granite ten or twelve feet high. The works of Mr. Bonomi showed that the anxiety of the Egyptians was not so much directed to the perfection of their obelisks as works of art, as it was to their magnitude. With regard to the erection of obelisks in this country, it would be very difficult to get blocks of the necessary size. It was suggested at the last meeting, that boulders adapted for the purpose might be had; but these large boulders would generally be found to be fractured to a great extent, from having been rolled over many miles in their glacial transit, and sometimes from having fallen over precipices. He did not think they could be got in Scotland. Referring to the cost of removing, and erecting the obelisk in Paris, he did not believe that operation had cost even the £30,000 named in the Parliamentary Paper; and Cleopatra's Needle could be brought over and erected here for a similar if not smaller sum. Mr. Kerr considered that the refinements of Greek art were entirely matters of taste; but he, on the contrary, believed that the Greeks had observed nature with so much minuteness, that they were able to perceive what was necessary to correct any optical delusion; and accordingly, contrived to make that look natural, which, if placed naturally, would look unnatural. [Mr. **Kerr** remarked that he merely said that entasis would be at once observed by an educated eye.] Monuments were not erected for uneducated eyes. Mr. Kerr appeared to congratulate the country for not having brought over Cleopatra's Needle; but he (Mr. Donaldson) should have wished to see the generosity of the nation exercised in the expenditure of a few thousand pounds on such an object, and to have seen it raised in London on the system of M. Lebas, without the use of the forest of timber required on Fontana's system, which Lebas had shown to be unnecessary. There could be no possible objection to erecting obelisks in this country: on the contrary, it was desirable to prove that our quarries could produce, our scientific men remove, and our artists erect, a fine monolith with such inscriptions upon it, as should be more significant than those of the Egyptians. Why should not they incise on monuments of this kind the names of their great generals,—and trophies or emblems, naval or military,—in such a manner as to meet with general acceptance? The main question raised by Mr. Burgess was as to the propriety of erecting obelisks at all in the present time. The feeling of the age was too utilitarian, and the general opinion was, that in erecting monuments or trophies they should not be merely such as to please the eye, but they must also have some useful purpose. This was a degradation of the object. In the noblest times of antiquity any great event, whether a victory in war, or the clearing the hill for the Trajan Forum, was commemorated by a triumphal arch or column, or similar structure. The Romans did not require that this should be useful in its character, but it was made to be a noble trophy, costly in its material, elaborate in its design, and representing the arts of the country and the character of the man whom it was intended to commemorate. This was the spirit in which such works ought to be carried out, and he could not but regret that the £100,000 set aside to erect a trophy of the Battle of Waterloo had not been so expended; a sum which would have produced a splendid monument, crowned with sculpture, and in every respect acceptable to architects and men of taste. He fully concurred with Mr. Burgess in thinking that monolithic obelisks of graceful form (such as that designed by Mr. Bell) would be appreciated by the public, and would carry conviction to the minds of all as one of a class of memorials most proper for great events.

Mr. GEORGE FOGGO, Visitor, said as the finest qualities of a man of talent would be wasted unless he could give expression to them, so a fine monument that could not speak to posterity would be equally looked upon with indifference. Inscriptions of some kind were essential to the effect of obelisks as monumental works.

Mr. JOHN BELL, Visitor, stated that Mr. Freeman (well known as a stone merchant) had informed him there was not the slightest doubt that monoliths of 100 feet long could be obtained at Lamorna and some other of the quarries of Cornwall. He understood, however, there would be some difficulty in getting such blocks in Scotland.

Mr. LOCKYER thought an inscription would be entirely lost upon an obelisk of 100 feet in height, especially on granite.

Mr. DONALDSON said that a single name,—such as "Wellington,"—could be easily and effectively inscribed upon a granite obelisk six or seven feet wide at the summit.

Mr. JOHN BELL concurred in thinking there would be no difficulty in inscribing granite obelisks.

Mr. DONALDSON (in reply to an inquiry) mentioned that Fontana had been paid by the timber required for the erection of the obelisk at St. Peter's, and had a pension of 1000 crowns a year besides for life.

Mr. M. DIGBY WYATT, H.S. said that in the absence of Mr. Burgess, one or two points mentioned by that gentleman, and now controverted, should be defended. He agreed with Mr. Lockyer as to the state of the Egyptian arts in the time of Moses, a well defined and universally accepted era; and his records of that period corresponded with the character of the monuments still existing. Mr. Kerr's impressions, unsupported by corroborative evidence, ought not to be allowed in any wise to disturb the conclusions which those, who had investigated the subject, had agreed to among themselves. All the chronologists agreed, within the limits of one or two centuries, in the antiquity to be ascribed to the races of the great kings of Egypt,—extending, as they did, for several centuries previous to the epoch of Moses. The only dispute amongst them referred to the duration of the respective reigns of those monarchs, and to the exact range of time to be allotted to the eighteenth and other dynasties. Any person, who examined Egyptian sculpture, would find that as it receded in date it was more perfect, and that the earliest of all was the most perfect,—leading at once to the conclusion that the highest state of cultivation existed at the earliest historic period. Mr. Kerr ascribed to Mr. Burgess opinions on the subject of the supposed mechanical powers possessed by the Egyptians, which the speaker had not gathered from Mr. Burgess' paper; and when Mr. Kerr asserted that the Romans had accomplished more difficult feats than the Egyptians in raising obelisks, it should be remembered that the Egyptians must have lifted these monoliths over and over again, to get them out of the quarries and over the cataracts (having carried them in one case no less than 600 miles) to their destined site; which was a far more difficult operation than any the Romans had performed; since these huge blocks, when quarried in the rough, must have weighed probably twice as much as at present, or when the Romans removed them. It appeared also to be an error to deny that the Romans had either made obelisks for themselves, or caused them to be made, since of the twelve enumerated by Mr. Burgess, no less than four would appear to bear the names of Roman emperors, and to be evident imitations of the more genuine and ancient ones. Mr. Kerr considered the Egyptians were an unpoetic people, but he (Mr. Wyatt) considered that their mythology abounded with poetry. They were the first nation to have painting and sculpture, and a complete system of hieroglyphics; and although we had not much of their writings to refer to, enough still remained to testify that they were not wanting in the poetic element. With regard to the cost of removing Cleopatra's Needle, his friend Mr. Owen Jones and himself had endeavoured to persuade the directors of the Crystal Palace to undertake the task of bringing it to England. Letters were received, almost in the form of tenders, and from very responsible persons, stating that they were prepared, for some such sum as £10,000 to £15,000, to make arrangements for bringing it over;—so that he thought the sum of £80,000 a very exaggerated estimate. (Mr. Hussey repeated that he had understood this was the cost of the Paris obelisk). With regard to entasis, he did not think the Greeks were wrong. Every artist must acknowledge that great subtilty in the treatment of lines was necessary to produce refined effects; and, except in very large works, distortions would arise unless compensations were made for the optical effect of straight lines impinging upon curved lines, and upon one another. The same principle had led the Gothic architects to give entasis to their spires; and the rules governing the subject resembled those of the contrast of colours. It was not in the case of single lines, but only where two lines met together, that it was necessary to resort to corrective curvature in parts.

The Chairman, Mr. Scoles, V.P., expressed his opinion that in polishing obelisks, and especially the lines of the inscriptions, the Egyptians had surpassed the art of the present day. He had never heard the cost of erecting the Luxor Obelisk in Paris stated at more than £24,000. He added that there was a remarkable identity in the line of inclination of all the Egyptian obelisks which had been actually measured, as might be observed on one of the diagrams exhibited, which he had drawn out.

Mr. J. W. Papworth observed that the whole gist of the question between the gentlemen who had spoken and Mr. Kerr was, that, at some time or other, Moses was in Egypt; but as to when that was, no one had more than a guess to offer.

NOTES ON THE ASSUMED USE OF CHESNUT TIMBER IN THE CARPENTRY OF OLD BUILDINGS.

By Wyatt Papworth, Architect.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, June 14, 1858.

The reason for my troubling you with the following remarks is twofold—first, that in the course of writing the paper on fir, which you kindly received at the commencement of this session, the controversy on chesnut and oak woods was continually brought before my attention in the works which there was occasion to consult; and secondly, that the timber of edifices, mentioned in several articles of the Dictionary prepared for the Architectural Publication Society, was often stated by the writers to be that of chesnut,—the sweet or Spanish chesnut,—the castanea vesca of botanists. Having made several enquiries, and having heard the result of others, I am inclined to believe that chesnut was *never used for timber*, at least in the large works in which it is generally attributed to have been employed. This may appear a bold assertion to those who have taken notice of the constant repetition of the word chesnut, but if you will listen to the grounds for my opinion, probably the subject will appear an interesting one in itself; and such statements as I have been able to collect, may suggest other conclusions than those usually received upon the use of this wood.

Harrison, writing in the time of Queen Elizabeth, only mentions the use, in times past, of sallow, willow, plum tree, hardbeam,* elm, and oak. Yet writers,† for a long succession of years, even whilst quoting the above passage, and others from this author, declare that chesnut timber was largely used in earlier times for building.

The confusion appears to have commenced with Evelyn, or about his time. In the Sylva ‡ he states that "The chesnut is, next the oak, one of the most sought after by the carpenter and joiner. It hath formerly built a good part of our ancient houses in the city of London, as does yet appear. I had once a very large barn near the city, framed entirely of this timber; and certainly the trees grew not far off, probably in some woods near the town; for in that description of London, written by Fitz Stephens, in the reign of Henry II, he speaks of a very noble and large forest which grew on the boreal [north] part of it." "If the timber be dipped in scalding oil, and well pitched, it becomes extremely durable, but otherwise I cannot celebrate the tree for its sincerity, it being found that, contrary to the oak, it will make a fair show outwardly when it is all decayed and rotten within; but this is in some sort recompensed, if it be true that the beams of chesnut tree have this property, that, being somewhat brittle, they give warning and premonish the danger by a certain crackling." Many writers, copying each other, have misquoted the above cited passage in Fitz Stephen, and declare that he states that the Spanish chesnut grew in great profusion in the forests near London.

The point at issue, the use of chesnut timber, was mooted so early as the years 1769 and 1771, in the pages of the Philosophical Transactions, ‖ when the Hon. Daines Barrington took up the question. He also writes, "Since you sent me the specimen of supposed chesnut, which was taken from the old hall of Clifford's Inn, I have been at some pains to examine into the authorities for the prevailing notion with regard to this being an indigenous tree. I remember the having once been present myself when a wager on this head was won; it being supposed that a small specimen of a beam, from a very ancient house in Chancery lane, was of this wood, which turned out to be nothing but common oak. When you placed your specimen from Clifford's Inn in my hands, I knew it immediately to be only the common oak." "Though so much hath been said of late with regard to the excellence of this wood for building, I cannot upon enquiry, find that it is greatly prized for this purpose either in Spain, Italy, or the South of France; but it is chiefly valued for the fruit.'

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* The hornbeam, or hardbeam.—Miller: Gardener's Dict.

† Hunt, Tudor Arch, p. 89; Hunter's edit. of Evelyn's Sylva, 1776, p. 159; and others

‡ p. 166-8 of Hunter's Edit. 1776.

‖ Vol. 59, p. 23, et seq.

"Ducarel," he continues, "in his Anglo-Norman Antiquities, p. 96, endeavours to prove that Old London was not only built with chesnut timber, but that there still continues a large tract of chesnut woods near Sittingbourne in Kent. I found on examination of these woods that the chesnuts are planted in rows about five yards distant from each other, without any trees scattered about, proving that they are not of natural growth. They are probably of the time of James or Charles I.

"We are told that the roof of Westminster Hall, Boston Church, and many others consist of this wood; not because any one hath found it to be so on examination, but because there are no cobwebs upon such roofs. Sometimes also, to account for spiders not harbouring in them, it is supposed that the timber is not English, but Irish oak. As this insect is known to subsist chiefly on the small flies which it surprises in its nets, the consequence is that it will no more be at the trouble of spreading its web where flies cannot be expected, than a fowler will lay his nets in a place where there is no resort of birds. No fly is scarcely ever to be seen but where there is a good deal of light and sunshine, consequently a wide wooden roof is the most improper places that a spider can lay its snares in: a whitewashed place would be selected by them in preference to a wainscoted one."

Ducarel, in reply,* says, "In my Anglo-Norman Antiquities, I had observed that many old houses in Normandy, when pulled down, are found to have a great deal of chesnut timber about them; as there are not any forests of chesnut trees in Normandy, the inhabitants have a tradition that this timber was brought from England. "Rudhall, near Ross, in Herefordshire is built with chesnut which probably grew on the estate, although no tree of the kind is now to be found growing wild in that part of the country. . . . The old houses in the city of Gloucester (as the Rev. Mr. Crawley informs me that he has often been assured) [!] are constructed of chesnut, derived assuredly from the chesnut trees in the forest of Dean. In some of the oldest houses of Faversham is much genuine chesnut as well as oak employed. In the nunnery of Davington, near Faversham (now entire), the timber consists of oak intermingled with chesnut. And the great beam of chesnut which supported the leads of the church tower at Faversham when it was lately pulled down, was found rotted for many feet at the extremity, and had as it were a mere shell of sound timber remaining about it."

Another writer, Mr. J. Thorpe, follows, and declares, that during the repairs of "the old house at Nettlested, in Stockbury [near Maidstone, in Kent], a main girder, besides other timbers, were pronounced by the surveyor and the builder to be chesnut. Cowsted, in the same parish, is entirely of the same wood. The curious roof of the large hall of the mansion house at Lesnes [near Erith in Kent] is of chesnut, which no doubt was felled in the abbey wood there." †

Hasted follows to the assistance of Ducarel, and states, "The ancient Norman buildings [he means buildings in Normandy] are mostly of this wood, which in all probability was fetched from this country. Most of the stone wherewith our monasteries and buildings of such sort were erected came from Normandy. This seems to have been a mutual traffic for some centuries between the two countries." "Oak timber is so entirely different from chesnut in the rings and spaces, which appear when cut transversely, that *it is impossible to mistake the one from the other*." Barrington, in replying to the three objectors to his views, says, "I have already said that I am willing to leave the point in controversy, upon what hath been advanced on the one side and on the other." It is curious that excepting the one observation about "the impossibility of mistaking the one wood for the other," these *four* writers do not attempt to describe the two woods.

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* Vol. lxi. p. 136.

† A description of Lesnes is given in the Archæologia, i. p. 44.

In a work of a later date,* it is stated that "many pieces of wood found in the old buildings of London, and supposed to be Spanish chesnut, were examined by Mr. Knight and found to be *forest oak*." Yet still the assertion is made of the use of chesnut.

Before I attempt to describe the difference between the two woods, reference should be made to some of the other buildings in which it is commonly reported that chesnut is used. The most important of these is the roof of Westminster Hall, which, as you are aware, was put up between 1395 and 1399, time of Richard II. It is reported that about the year 1560, and for a century before, the English had exported vast quantities of oak from Ireland; and from a statement given in some of the scientific journals for 1856,† it would appear that Irish oak was appreciated at a still earlier epoch, for "A record in St. Michan's Church, Dublin, which is verified by 'Hanmer's Chronicle' in the library of Trinity College, states that the faire greene or commune, now called Ostomontowne Green (now Oxmonton), was all wood, and hee that diggeth at this day to any depth shall finde the grounde full of great rootes. From thence, anno 1098, King William Rufus, by license of Murchard, had that frame which made up the roofes of Westminster Hall, where no English spider webbeth or breedeth to this day." In a treatise on Naval Architecture, by Nicholas Witsen, a Dutchman, in 1671, it is stated that the Hollanders were plentifully supplied from Ireland with oak, for the best and toughest of their work in shipbuilding. Of course the above extract does not allude to the *present roof* of the Hall; but in support of the probability of its being of oak as now generally asserted, and not chesnut, "Tradition," says Hayes,‡ "gives the Shillela oak [a district in the county Wicklow] the honour of roofing Westminster Hall and other buildings of that age: the timbers which support the leads of the magnificent chapel of King's College, Cambridge, which was built in 1444 [begun, he should have said, as it was not vaulted till about 1515], as also the roof of Henry VIII.'s [VII?] Chapel in Westminster Abbey, are said to be of oak brought from these woods, and I think it by no means improbable, that the superior density and closeness of grain which is the character of the Irish oak, particularly in high situations and a dry soil, as may appear by comparing its specific gravity with that of other oak, added to the inattention of the Irish at that time to the article of bark, which permitted their oak to be felled in winter, when *free from sap*, might have induced the English architects to give it the preference in such material works; and it must be allowed that the present unimpaired state of these roofs, after so many centuries, seems very well to warrant this conjecture. It is generally understood that a sale was made of the finest timber of Shillela which remained in Charles II.'s time, into Holland for the use of the Stadt-house and other buildings, constructed on piles driven close together to the number of several hundred thousand. In 1669 William Earl of Strafford furnished Laurence Wood of London with such pipe staves, to a great amount, at £10 per thousand, as are now sold for £50, and are only to be had from America. The year 1692 introduced into Shillela that bane of all our timber, iron forges and furnaces . . . and it is inconceivable what destruction they must have made in the course of twenty years, which was the term of their contract.''

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* Transactions of the Highland Society, v. 256.

† Builder Journal, xiv. p. 53.

‡ Practical Treatise on Planting, &c. 1794, p. 110.

Another authority for the present roof being of Irish oak is Barclay,* who, in his Icon Animorum, published in 1614, and dedicated to Louis XIII. of France, mentions that the timber of Westminster Hall was brought from Ireland. Rees' Cyclopædia, article Westminster, contradicts its being of Irish oak, but states it to be of chesnut from Normandy; and Mr. Nightingale, in the Beauties of England and Wales, declares that it is built of chesnut supported by ribs of oak. The Irish oak, however, was employed by Charles V. (who reigned in France as cotemporary with our Richard II.) for the roof of the library of the Louvre; and it is so stated by L'Abbé Sallier, in the Introduction to the great catalogue of the Bibliothéque du Roi (of which the Louvre library was the commencement), and this observation has been copied by later writers. Consequently it may be inferred that Irish oak may have been used at Westminster. Of course I do not claim the merit of first making these historical facts known, but as they have laid dormant for the last twenty years at least, their revival may perhaps assist in preventing the future repetition of the common assertion of the "chesnut roof," even without the authority of Britton and Brayley,† who state that "the entire roof is of oak;" and Tredgold, in the first (1820) edition of his Carpentry, informs us "that the roof of King's College Chapel at Cambridge may be cited as an example of the durability of chesnut in a dry state: also the roof of the church of Notre Dame at Paris. Rondelet, however, observes, that several old buildings near Paris, of which the timbers were supposed to be chesnut, were examined by Buffon and D'Aubenton, who found the pretended chesnut to be a variety of oak; and it is probable that a closer examination will prove the roof of Westminster Hall to be of oak." In the second, or 1828 edition, is added in a note, "After the first edition was published, the author examined some specimens of the rafters, &c., and found it to be of oak, with a fine kind of *septa;* December 1820." It is only this year that I was strongly assured that the whole roof was of chesnut. The box which I am enabled to exhibit by the kindness of Mr. J. W. Hiort is made out of this supposed chesnut; as is also the set square, lent to me by Mr. Rowe of Cambridge.

The roof of St. Nicholas' Church, Great Yarmouth, is stated to be of chesnut. I had hoped to have been able to have ascertained this satisfactorily last year, whilst staying in that town, but having left the examination of the church until the last day of my stay, I found, when arrived in the belfry, that lights, as well as much courage, were wanting to grope amongst the old timbers, where shortly before a lad had stumbled and been precipitated through the boarded ceiling on to the floor of the church. Whilst there I obtained the accompanying piece of what all the local carpenters call chesnut; it formed part of a standard to a former gallery, put up in 1640. The grain is very peculiar; but it is oak, not chesnut, and closely resembles a panel I have seen labelled as "English oak."

Brandon, in his valuable work on Timber Roofs of the Middle Ages, says, "they are all of oak or chesnut." The roof of Chartres Cathedral, burnt in 1836, was said to have been of oak and chesnut.‡ In the description in the Monasticon‖ of Castel Hymel, or Fineshed Priory, in Northamptonshire, there is an improvement on the misunderstanding: "In the granary lately taken down the beams were of *horse-chesnut.*"

Of another well known structure, still said to be roofed with chesnut,§ it is reported that "the timber used for the scaffolding, &c., and for the upper roof of the chapel [of King's College], seems to have been given to the college by Henry VII. and his executors, over and above the £1000 before mentioned, for the college paid only for felling and carriage; it was brought from the Wethersfield

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* Gentleman's Magazine, June, 1837, p. 370, 583.

† Westminster Palace, 1836, &c. p. 441.

‡ Builder, xi. p. 693.

‖ Vol. vi. Part I., p. 449.

§ Le Keux, Memorials of Cambridge, ii. 43.

Park, Poule Park, Walden Park, Ashden Halys, Bardefield Park, Broxstey Park, all which are in Essex, and some from Cartlyng (Catlige) in Cambridgeshire; the timber of the roofs I believe was chiefly from Wethersfield." If this be correct, Hales, before quoted, is wrong in stating that it was obtained from Ireland, and tradition is again worthless; but did the county of Essex ever grow chesnut trees for timber? I must regret that I have had no opportunity of inspecting the roof timbers of this chapel, so as to satisfy myself.

Two pieces of wood called chesnut have been kindly forwarded by Mr. Rowe, taken out of old buildings at Cambridge, both of which I submit are oak; as well as another piece sent by him from an old house at King's Stanley near Stroud, lately pulled down—it is a fine specimen of an oaken beam between 250 and 300 years old. Also another piece of a moulded beam, taken out of the principal gateway of Trinity College, Cambridge; it was situated in Sir Isaac Newton's study, being the first-floor room over the gateway. This is also oak.

Besides having been used for beams, it is stated,* that at the end of the sixteenth century *wainscot floors* were much in use, and in some manor houses, *chesnut floors*, as at Cotele in Cornwall, an ancient house; and also at Mount Edgecumbe in Devonshire. †

I will now submit some specimens of the actual woods under discussion. The first is a veneer of chesnut, as sold by the fancy-wood merchants. Mr. Ashpitel (whose absence on this occasion is to be regretted) kindly obtained for me specimens of oak and of chesnut, *both grown in the same wood*, in Kent, which suffice not only to show how close is the resemblance between the two woods when young, but also how the difference between them is to be observed. As these small pieces, however, could hardly be considered sufficient, I inquired for some larger specimen amongst the timber-yards of the Metropolis, and when about giving up the search in despair, obtained a board, which being 21 inches in width, will show the grain clearly. There are also some other specimens to which I will refer presently.

How is chesnut, then, to be distinguished from oak, and is it at all serviceable as a timber?

One of the practical suggestions that has been made for discovering the difference, is given in Nicholson's Dictionary of Architecture, who states that it may be found by driving an iron pin or nail into the woods while fresh: in the oak a black stain will be produced, but not so in the chesnut. This observation is repeated in another work; and they are the only two in which I have seen it named. I tried the experiment with the two fresh pieces sent me by Mr. Ashpitel, and you will perceive that both of them have the stains; the two in the oak showed in two days, and of those in the chesnut, one showed in two, and the other in four, days time. Another suggestion is to weigh a portion of the wood in question. Dry chesnut, according to Tredgold, "weighs from 34 to 38 lbs. per cubic foot, whereas dry English oak weighs generally from about 50 to 55 lbs. One dry specimen from an old oak tree weighed 39 lbs., or about the same as chesnut." On weighing the piece of wood from King's Stanley, above mentioned, I found a cubic foot of it would weigh 53 lbs.

A third idea is rather more laughable than serious, and has already been adverted to; it is one, however, which, from its being "a wise saw," ought not to be neglected, especially as the "spiders" are so often put forward as better authorities than ourselves in the settlement of what is oak or chesnut. In addition to what has been said in the earlier portion of this paper, you will find several remarks under the heading of "Spiders and Irish Oak," in Notes and Queries for last year (p. 208, &c.) 'thus, in Pointer's Oxoniensis Academia, 1749, is the following, in his account of the curiosities of Christ Church College. The roof of the aforesaid hall is remarkable on this account, that, tho' it be made of Irish oak, yet it harbours spiders, in contradiction to the vulgar saying. Tho' I am apt to think that there may be some pieces of English oak amongst the Irish; or else probably that particular smell that proceeds from that sort of oak, and is perhaps so distasteful to that sort of vermin, may be spent through age, or disguised by smoak, and so that common saying may stand good still.' It is also shown, p. 293, that the spider 'has *no dislike* to fixing its web on Irish oak;' also that 'no spider will hang its web on the roof of Irish oak in the chapel or cloisters at Winchester:' and 'chesnut is said to possess the same virtue.' 'The cloisters of New College, roofed with chesnut,' are free from spiders; 'the choir of St. David's Cathedral is stated to be roofed with Irish oak, and there are no cobwebs, although they are plentiful enough in other parts of the cathedral:' and lastly, that 'a fine old roof at Turner's Court, in the parish of Cold Ashton, Gloucestershire, four miles from Bath, is perfectly free from cobwebs, and is said to be of chesnut.'

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* Brown's Domestic Architecture, p. 156.

† Since reading these 'Notes,' my friend Mr. W. Damant of Plymouth, accompanied by a gentleman well versed in the nature of timber, has kindly examined for me the presumed chesnut floors at Mount Edgecumbe; they pronounce them to be "of what at the time of laying was, young oak—excepting that in two or three small window recesses, and in the margins to the hearths, chesnut had been employed. There were also two or three short pieces of chesnut in the floor of the drawing room, but they appeared to have been used in repairs. The floor certainly was not chesnut, nor was that wood employed at all in the other joinery of the house."

The qualities of chesnut wood, as required to be known by us, are thus admirably described by Selby, in his History of British Forest Trees, 1842:—"The only particular in which the chesnut exhibits a decided inferiority (to the oak), is in the quality of its timber, which, unlike that of the oak, which gains strength and durability by age, begins to deteriorate at heart, ere the tree has passed much beyond the first half-century of its growth;" "By some the chesnut has been considered as indigenous to England—the more general opinion, however, is that it is not a native, but was introduced at a very distant period, probably by the Romans. The belief which so long and so generally prevailed, and indeed, we may add, still partially exists, that the roofing and main beams of many of our ancient buildings and houses were framed of the chesnut, naturally gave rise to the idea that a tree so abundant and generally distributed as it must have been in former ages, must also have been of indigenous growth; for this supposed chesnut timber, we may remark, is not confined to buildings in the southern and midland districts of the kingdom, but is also found in the northern counties, and even in Scotland, for Sir T. Dick Lauder, apparently not aware of the discoveries of Daubenton and others, instances the roof of the parliament house at Edinburgh as constructed of chesnut:" and in a note, "It is remarkable that the same belief of the use of chesnut wood in ancient buildings also prevailed in France. Buffon, however, and afterwards Daubenton, showed that the timber taken for that of the chesnut was in fact that of quercus sessiliflora. The examination, however, and the repeated experiments of late years which have been made upon this wood, have satisfactorily proved that, in all such instances, the timber of the oak, and chiefly of the sessile fruited kind, have been mistaken for chesnut; and this fact, in a great measure, does away with any argument that might otherwise have been adduced in favour of the chesnut's indigenous origin, had the application of its timber in reality been as extensive as these ancient buildings seemed to indicate. It is also more in accordance with what we collect from the *earliest* of our arboricultural writers, viz.—that the chesnut in their time was by no means of common occurrence or widely distributed." "The fact is, as Buffon first observed, the wood of the oak, more particularly that of the sessile fruited variety, assumes in course of time a near resemblance in colour to that of the chesnut in its best condition, or when young and untainted at heart; and as few chesnuts could have acquired the scantling frequently observed in the timbers of these ancient buildings at the age dialing or decay almost invariably commences, this in itself furnishes a strong argument against the use of chesnut timbers and beams by our ancestors, inasmuch as the trees must have *become unfit for the purpose* long before they had attained the necessary dimensions." "In appearance and colour, the wood bears a resemblance to that of the oak, but may always be distinguished by its want of the large laminæ (flash) or transverse fibres which are seen in the oak, particularly when cut perpendicularly on the outside, in the plane of these laminæ." "For gate and other posts, railing, spars for building, piles, and various other purposes not requiring wood of large size, it is well adapted, and perhaps as durable as any other timber we possess."

Sir H. Davy,* also says, "It may easily be known by its want of the laminæ, as also from the pores in the alburnum of the oak being much larger and more thickly set than those in the chesnut, which cannot be distinctly seen without the aid of glasses."

The difference between the woods of the two oaks commonly seen in England, is that the grain of the wood of quercus sessiliflora is generally less varied and of a more uniform and deeper colour than that of quercus pedunculata, and with less of that laminated appearance which is called the *flash* or silver grain. The trees are said to be known by the sessiliflora having the acorn stalks *short* or seated, with the leaves *long;* while the pedunculata is the reverse, having the acorn stalks *long* and the leaves *short.* The acorns of the former grow in clusters of two or three close to the stem of the branch; those of the latter grow singly or seldom two on the same footstalk. The quercus pedunculata, or robur, as it is more generally called, is the true old English oak, the sessiliflora being supposed to have been introduced some two or three ages ago, from the continent. There appears to be much diversity of opinion among botanists and planters on the value of the timbers of these two oaks, to the same extent at least as that already shewn to have existed on the use of chesnut; and some authors deny the botanical difference of the trees.

I have much gratification in being able to exhibit specimens of each of these species of oak, and also others of chesnut, by the well known liberality of Dr. Lindley, who at once responded to my application for the loan of them for this evening's exhibition: my remarks will thereby be rendered more intelligible on your personal comparison of the several woods.

Chesnut timber has been often urged as a material for ship-building. One apparently qualified writer, Monteath, says,† "Notwithstanding the excellent quality of the Spanish chesnut timber, which is equal to the oak in ship building, and also for any machinery, yet it has not been generally used; but this tree should be both more planted and more used as timber." Also, "Spanish chesnut is used by cabinet-makers for boxing, at 2s. 6d. per foot, though it is of much more value when suitable for ship-building, as it is often used for that purpose." While Matthews, in a much commended work on Naval Timber (1831), says, "There is one circumstance connected with this timber in this country, at least in Scotland, which must prevent its general use in ship-plank, and be of material injury to it for ship timbers; this is, that few trees of it of size are found without the timber being shaky or split, some to such a degree that the annual rings or concentric growths have separated from each other." "From the use of the Spanish chesnut in the Spanish Navy, both in planking and timbering, and from the roofing beams and ornamental work of Westminster Hall being also of this wood, we should suppose it was not so liable to this defect of rents in the timber in milder climates. It is, we should think, as capable of supporting weight, when stretched as a beam, as the oak. Having much less proportion of sap wood, and from the matured wood containing much less sap or moisture, we should suppose it not so liable to dry-rot, or that more simple means, or a shorter period, would suffice for seasoning it, so as to be proof against this evil." According to Belidor, chesnut soon rots when built in a wall, therefore the ends of joists of this wood should have a free space left around them.‡

In the 10th volume of the Transactions of the Society of Arts,|| the writer urges that "for most purposes except shipbuilding, chesnut will be found equal to oak; and in buildings and out-door

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* Agricultural Chemistry, p. 222, 4to edition.

† The Forester's Guide, 1824, p. 194.

‡ Tredgold's Carpentry, p. 225.

|| 1792, p. 27.

work, much superior. In 1726 a piece 13 in. square was used as a hanging-post to a gate, and being found, after fifty-two years use, perfectly sound, was again put down for a clapping-post. In 1743 a large barn was built with some of this timber and is now sound in every part, as well as several chesnut posts and rails, after standing thirty or forty years. And a fencing made of oak and chesnut posts, being removed after twenty years standing, the chesnut was found perfect, while the oak posts could not be used again without a spur to support them. The writer accounts for Evelyn's assertion of the decaying nature of chesnut, by stating that it is the case with old chesnut, that has been suffered to stand beyond the time of its attaining its full growth; it is then the worst of all timber, being more brittle and more apt to crack and fly into splinters than any other; but he adds, I have never known this to be the case with young chesnut. If it be cut when it squares only six inches, it will be as durable as an oak of six times its size and age."

My attention has been directed to many other works describing chesnut, but the majority of them are mere repetitions of the views or mistakes of earlier writers, rendering it quite unnecessary to detain you while quoting them.

From all these varied statements then, we may conclude, that the absence of spiders is not sufficient evidence to determine whether the woodwork under inspection is oak or chesnut, or even whether it be either of those timbers.

That when the outside of timber presents that rotten dusty appearance generally seen in old roofs, it will be next to impossible to decide whether it be of oak or not; and that the only way to discover the fact will be by obtaining a well smoothed portion of it, or if possible, a sight of the ends of some of the pieces, from which to ascertain whether there are any laminæ—the absence of them being the distinguishing mark of chesnut.

That taking into consideration all the evidence collected, there is no proof of chesnut timber having been used in Mediæval buildings; therefore all results which have been promulgated upon the efficiency of a so-called chesnut timber must be valueless as regards that timber.

That certain experiments would appear to decide that small scantlings of chesnut are quite equal, if not superior, to oak for several purposes, "but the wood of old trees is unfit for any situation where an uncertain load is to be borne, as it is brittle." "It bends more than oak at the time of fracture, and therefore is tougher. Its toughness seems to permit it to yield insensibly till every particle exerts its utmost force, and then it gives way at once, more in the manner of metals than in that of woods." * This well known circumstance alone, should have raised a doubt in the minds of some of our instructors, before they affirmed so strongly that chesnut timber had been largely used in our Mediæval buildings.

The lateness of the hour prevented any lengthened discussion on the subject of Mr. Papworth's paper.

The Chairman mentioned that iron would cause a stain in oak, but would not affect chesnut.

Mr. C. H. Smith, H.M., recommended the test afforded by steeping oak shavings in a solution of ferrocyanide of potassium, which would produce an ink-like mixture; and Mr. Jennings, Fellow, stated that self-sown chesnut trees are not met with in this country; the tree being cultivated in plantations, and affording a serviceable timber for out-door purposes.

Thanks were voted to Mr. Wyatt Papworth, for his paper, and to Dr. Lindley, for the loan of numerous specimens to illustrate it.

Mr. McKinnell's mode of Ventilation having been explained, with the assistance of a large model, by Dr. Aitken, the Meeting was adjourned to the commencement of November.

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* Tredgold. 227; and Evelyn.

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